

THE THIRD EDITION  
EVERYMAN'S ENCYCLOPÆDIA  
IN TWELVE VOLUMES .

VOLUME TWELVE  
SPITALFIELDS—ZYMOTIC

EDITED BY ATHELSTAN RIDGWAY, LL.B.





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EVERYMAN'S  
ENCYCLOPÆDIA

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RETROCONVERTED  
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VOLUME TWELVE



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# ABBREVIATIONS

The titles of subjects, which are printed first in bold type, have been abbreviated within each article to the initial letter or letters

**ac.**, acre(s).  
**agric.**, agricultural  
**ambas.**, ambassador(s)  
**Amer.**, American.  
**anct.**, ancient.  
**ann.**, annual.  
**arron.**, arrondissement.  
**A.-S.**, Anglo-Saxon.  
**A.V.**, Authorised Version.  
**h.**, horn.  
**Biog. Dic.**, Biographical Dictionary.  
**bor.**, borough  
**bp.**, birthplace  
**Brit.**, British.  
**C.**, Centigrade  
**c.**, about.  
**cap.**, capital.  
**cf.**, compare  
**co.**, county.  
**com.**, commune.  
**cub. ft.**, cubic feet  
**d.**, died.  
**Dan.**, Danish.  
**dept.**, department.  
**dist.**, district.  
**div.**, division.  
**E.**, east; eastern.  
**eccles.**, ecclesiastical  
**ed.**, edition; edited.  
**e.g.**, for example.  
**Ency. Brit.**, Encyclopædia Britannica.  
**Eng.**, English.  
**estab.**, established, establishment.  
**F.**, Fahrenheit.  
**fl.**, flourished.  
**fort. tn.**, fortified town  
**Fr.**, French.  
**ft.**, feet.  
**Ger.**, German.  
**Gk.**, Greek.  
**gov.**, government  
**Heb.**, Hebrew.  
**hist.**, history.  
**horticult.**, horticultural  
**h.p.**, horse-power.  
**hr.**, hour.  
*i.e.*, that is  
**in.**, inch(es).  
**inhab.**, inhabitant(s)

**is.**, island(s)  
**It.**, Italian.  
**Jap.**, Japanese.  
**jour.**, journal.  
**Lat.**, Latin.  
**lat.**, latitude.  
**lb.**, pound(s).  
**l. b.**, left bank.  
**long.**, longitude.  
**m.**, mile(s).  
**manuf.**, manufacture.  
**min.**, minute(s).  
**mrkt. tn.**, market town  
**MS.**, manuscript.  
**mt.**, mount; mountain.  
**N.**, north; northern.  
**N.T.**, New Testament.  
**O.E.**, Old English.  
**O.F.**, Old French.  
**O.T.**, Old Testament.  
**oz.**, ounce(s).  
**par.**, parish.  
**parl.**, parliamentary.  
**pop.**, population.  
**prin.**, principal.  
**prof.**, professor.  
**prov.**, province; provincial  
**pub.**, published; publication.  
*q.v.*, which see.  
**R.**, riv., river.  
**r. b.**, right bank.  
**Rom.**, Roman.  
**R.V.**, Revised Version.  
**S.**, south; southern.  
**sec.**, second(s).  
**sev.**, several.  
**Sp.**, Spanish.  
**sp. gr.**, specific gravity.  
**sq. m.**, square mile(s).  
**temp.**, temperature.  
**ter.**, territory.  
**tn.**, town.  
**trans.**, translated; translation  
**trib.**, tributary.  
**univ.**, university  
**urb.**, urban.  
**vil.**, village.  
**vol.**, volume.  
**W.**, west; western.  
**Wm.**, William.  
**yd.**, yard.

The article ABBREVIATIONS contains a list of those in general use.  
*See also* ABBREVIATION (music) and ELEMENTS (chemical) symbols.



**Spitalfields**, dist. of E. London, in the metropolitan bor. of Stepney, on the N. side of the Thames, called after the hospital of St. Mary Spital, founded there in 1197 by Walter Brune and his wife. It became a great seat of the silk manuf., which was estab. there by the Fr. emigrants after the revocation of the Edict of Nantes. There is a large market, built in 1928.

**Spitfire**, single-seat fighter monoplane, made by Vickers-Armstrong from designs by R. J. Mitchell (*q.v.*). The S. is derived from the Vickers Supermarine S.6B, winner of sev. Schneider trophies, was first flown in 1936, and was introduced into the R.A.F. in 1938. With the Hurricane (*q.v.*) it became famous in the battle of Britain, and successive types were used throughout the war, thereafter being replaced by the Spitfire and the Naval Air Arm Seafang. Powered by the Rolls-Royce Merlin engine, the speed of the S. was steadily developed to 369 m.p.h. in 1943. In 1946 the Griffon engine was introduced and a speed of 450 m.p.h. attained. The armament at first consisted of eight 303 Browning machine guns, but four 20 m.m. cannon were later used. The S. was used in many theatres of war, as fighter, fighter-bomber, photographic reconnaissance craft, and in the naval seafire version. The wing span of the sev. varieties remained at 36 ft. 10 in.

**Spithead**, roadstead in the Eng. Channel, between Portsmouth and the Isle of Wight, often selected for naval manoeuvres. Here was fought in 1546 a battle between the Eng. and Fr. fleets, in which the latter was dispersed.

**Spitsbergen**, or (with Bear Is.) **Svalbard**, group of is. in the Arctic Ocean, lying between Franz-Josef Land and Greenland. The prin. is. are W. Spitsbergen, Edge Is., N.E. Land, Bear Is., Barents Is., and Prince Charles Foreland, and the land area of the group is about 24,295 sq. m. They are said to have been discovered by Barents in 1596, but it is probable that Sir Hugh Willoughby visited the is. in 1533, and that the Norwegians visited them in 1194. All the is. are mountainous, the highest peak (5580 ft.) being situated near Treurenberg Bay. There is much ice, generally in the form of long glaciers in valleys. S. lies between 76° 30' N. and 80° N. lat. In this lat. there is total daylight for 122 days; for 217 days there is either full sunlight or twilight only; and for a period of 115 days the sun does not rise above the horizon, but there is twilight for part of the day and total darkness during the remainder. Polar bears, foxes, and reindeer are amongst the land animals; milk-oxen have been introduced. The elder-duck and other wild-fowl breed on the is., and seals and walrus are found. Whale-hunting was carried on in the

seventeenth century, and possession of the area was then disputed between the Norwegians, Dutch, and Eng. Whale-hunting ceased in the eighteenth century, but on the discovery of rich beds of coal the question of sovereignty was again raised. Norway's sovereignty of the is. was recognised by treaty in 1920, and in 1925 the archipelago was officially taken possession of by Norway. In 1947 the Soviet Gov. raised the question of revising the treaty of 1920 on the ground that it was signed without the Soviet Gov.'s knowledge, that it included Medveshili Is. (forming part of the Spitsbergen Archipelago—actually a Russian is.), and that it disregarded the interests of security of the U.S.S.R. in the N. as well as Russian economic interests. Agreement was reached with Norway on the necessity of joint defence of Spitsbergen, and Russian camps were estab. The is. are important as a stage in trans-polar air-routes. The chief mineral is coal, some 500,000 tons annually being mined, and asbestos and copper are also found. The wintering pop. is about 2300, and there are sev. permanent mining camps, the largest being at Longyearbyen. A raid on Spitsbergen early in Sept. 1941, largely conducted by Canadian troops, destroyed the coal-mines and power installations there, which might eventually have been seized by the Gers. There was a Ger. naval raid two years later. See R. M. Rudmose Brown, *Spitsbergen*, 1920, and V. Romanovsky, *Le Spitzberg et la Sibirie du nord*, 1943.

**Spittal**, par. of the bor. of Berwick-upon-Tweed, with fertiliser and chemical works. It has a fine beach and cliffs. Pop. 1600.

**Spitteler**, Carl Friedrich Georg (1845-1924), Swiss poet and novelist, *b.* at Lucerne. After studying law and theology he became a teacher in Finland and Russia, and later in Neuveville. He was an editor in Basle and Zurich, and after 1892 a free-lance journalist. S. first came into prominence with the impressive poetic work *Der Olympische Frühling* (1905), and for this and his later work he received the Nobel prize for literature in 1919. S. set himself against the naturalistic tendencies of his time, approaching them only in his minor works. His collected works were pub. from 1945 onwards, ed. by G. Bohnenblust, W. Altwegg, and R. Faesi. See lives and studies by R. Faesi, 1933; C. Baudouin, 1938; F. Buri, 1945; G. Bohnenblust, 1945; and L. Reiger, 1947.

**Spitz**, see POMERANIAN DOG.

**Spleen**, largest of the ductless glands. In man it is an oval body about 5 in. long, situated on the left side of the abdominal cavity towards the rear at the level of the tenth rib. The external surface is bounded by the diaphragm, the pleural cavity, and the lower ribs; the internal

## Spleenwort

surface touches the left kidney and the fundus of the stomach. The S. is enclosed by a fibro-elastic coat which allows of considerable extension. The coat sends processes called trabeculae into the S., dividing it into small compartments containing S. pulp, which consists of Malpighian corpuscles, lymph corpuscles, red blood corpuscles, and fat. The S. takes part in breaking up worn-out red corpuscles, and in forming white ones, and by producing uric acid assists nitrogenous metabolism.

**Spleenwort**, name given to various species of ferns in the genus *Asplenium* (q.v.). Thus *A. trichomanes* is the common S., *A. ruta-muraria*, the wall S.

**Splenic Fever**, see ANTHRAX.

**Splint**, bony enlargement, usually on the inside of the foreleg just below the knee, and rarely on the hind shanks, of horses. It is due to an injury setting up inflammation which causes an exostosis or bony tumour.

**Splints**, structures made of wood, leather, zinc, or other material shaped so as to fit about a fractured limb in order to render it immovable. The same effect can be produced by the use of bandages stiffened with mucilage, or, with still greater effect as regards rigidity, moulds of plaster of Paris.

**Split** (formerly *Spalato*), seaport of Croatia, Yugoslavia (Dalmatia), on a promontory on the E. side of the Adriatic, 74 m. S.E. of Zara. It has an excellent harbour. S. was one of the great cities of the Rom. world, and is famed for the vast palace built by Diocletian, which was his residence after his abdication. Much of the tn. stands within what were the walls enclosing the subsidiary buildings and grounds. The finest portions of this palace are still extant. The modern tn. carries on trade in wine, oil, grain, and cattle, and is noted for its liqueurs. Pop. 49,800.

**Spügen**, pass across the Rhaetian Alps, forming part of the boundary between Switzerland and Italy. It has an altitude of 6945 ft., and is 23 m. N. of the head of Lake Como. A roadway over the pass was constructed between 1819 and 1821.

**Spode**, variety of china ware. In 1770 Josiah S. the elder, an apprentice of Whieldon, having acquired some pottery works at Stoke-upon-Trent, manufactured blue willow-pattern table ware, black-printed china, and vitreous glazed ware of basalt and jasper. About thirty years later his son, Josiah the younger, made a felspar porcelain which has long been the general type of porcelain used in England. The felspar was added to a composition of china-clay, stone, and crushed bone, thus producing a soft paste which gave a translucent body and a smooth transparent glaze. Later he made what he styled 'opaque porcelain' or ironstone china used for table services or other useful articles. S. shapes were good and their pieces decorated with flowers and gilding. The marks used include a floral wreath and the words 'Spode felspar porcelain,' or these words without a wreath, or simply 'Spode' on a cartouche or scroll.

## Sponges

**Spofforth, Frederick Robert** (1853-1926), Australian cricketer, b. at Sydney, N.S.W. He visited England with each of the first five Australian teams that played there, beginning in 1878. Known as 'the Demon Bowler,' for his fastness and ingenuity, in 1878, at Lord's, S. took ten wickets for twenty runs, and during the early eighties frequently performed similar feats. He settled in England, and died at Ditton.

**Spofford, Harriet Elizabeth, née Prescott** (1835-1921), Amer. story-writer and poet. Her first novel, *Sir Rohan's Ghost* (1860), is in the tradition of Mrs. Radcliffe's *Mysteries of Udolpho* and the tenebrous stories of Poe. She is chiefly known for her numerous romantic short stories, *The Amber Gods* (1863) being the first collection.

**Spohr, Ludwig** (1784-1859), Ger. violinist, composer, and conductor, b. at Brunswick, studied with Kunisch and Maucourt and Hartung. He was court musician at Gotha (1805), and opera-director at Vienna (1812) and Frankfurt (1817). Finally he settled at Kassel (1822-57) as court choirmaster. S. left nine symphonies, eight overtures, ten operas, four oratorios, and many violin concertos and chamber works of the Romantic school. He is important in the development of violin playing. His autobiography appeared in 1850-61 (Eng. trans. 1865).

**Spokane**, city of Washington, U.S.A., cap. of co. of same name, 230 m. E. of Seattle. It was first settled in 1874 and known as 'Spokane Falls,' from the adjacent falls on S. R. There are two univs. S. is an important commercial tn., and its industries are connected with lumbering, the rich mines (gold, silver, copper, etc.) in the neighbourhood, and agric. products. Pop. 122,000.

**Spoleto**, city of Tuscany, Italy, in the prov. of Perugia, 60 m. N.N.E. of Rome. About 242 B.C. it was a Rom. colony (Spolegium). It was later the cap. of a Lombard duchy, and from 1220 to 1860 a papal tn. The cathedral was begun in the seventh century. There is a Rom. amphitheatre, aqueduct, and other remains. It trades in grain, silk, wine, and oil, and produces truffles. Pop. 36,500.

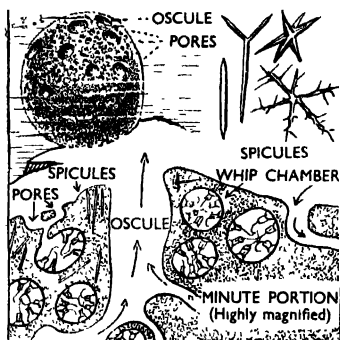
**Spondee**, in prosody, a metrical foot consisting of two long syllables, equivalent to a dactyl or anapaest, and thus met with in these metres. Examples: 'arbor,' 'primrose,' etc.

**Spondias**, tropical genus of Anacardiaceae, which contains about half a dozen species. The fruit is a drupe, and under the name of hog-plum is often eaten.

**Sponges**, or *Porifera*, simple form of animal life, the structure being cellular, with no differentiation into organs, and only slight tissue formation. Their relation to other forms of simple animal life is obscure. A simple sponge consists of a sac attached at one end to some support, the other having an opening or oscule. The walls are pierced with many pores. It is contained between the ectoderm and endosperm, the whole being strengthened by a minute skeleton of calcareous or siliceous spicules. The flagella of the

## Sponges

collar cells (or choanocytes) in the endoderm, which surround the pores, continuously lash the water so that a flow of water, supplying food and oxygen, is drawn into the sponge through the pores, waste matter being ejected through the oscule. Through this also are disseminated the reproductive elements. The *Ascteta primordialis* and *Grantia compressa* (common in Brit. waters) belong to this type as does the *Hamoderna lycandra* where the sac is convoluted and a protective armour of spicules developed: these belong to the *Ascon* type. In the *Sycon* type, such as *S. citiatum*, found in deeper water, there is greater specialisation of cells of the endoderm and a progressive development of convolution into chambers and channels. In another development, the *Rhagon*, the endoderm develops spherical chambers within the paragaster.



Sponge

The arrows show the direction of currents.

S. are usually classified according to skeleton, but a few, the Myxospongiae, have no skeleton at all. The pigments found in S. are chiefly brown or red, e.g. floridin. The fresh-water sponge, *Spongia*, is the only one possessing green colouring matter, allied to chlorophyll. The four families of S. are the Calcarea, the Hexactinellida (which includes the beautiful *Euplectella* or Venus's Flower Basket), the Tetraxonida, and the Keratosa (which include the bath sponge).

Reproduction is accomplished: (1) by the asexual formation of buds which become detached and float away from the parent on the death of surrounding parts; (2) by fission; (3) by sexual means.

The sponge of commerce, *Euspongia*, is chiefly obtained in the Mediterranean, particularly from the Levant and the Adriatic, the coasts of Barbary, Tunis, and Syria being visited regularly by boats.

See F. M. Duncan, *Animals of the Sea* (Romance of Reality series), 1922; E. G. Boulenger, *The Under-water World*, 1928 (a popular introduction to sponges, worms, molluscs, etc.); and L. H. Hyman, *The Invertebrates* (Protozoa through Ctenophora), 1940 (which contains a full bibliography).

## Spoons

**Sponge, Vegetable**, see LOOFAN.

**Sponsors**, godparents who present a child for baptism and make the baptismal confession and promises to keep the faith, in its name. According to the rule of the Church of England, every male child must have two godfathers and one godmother, while a female child has two godmothers and one godfather. In the Rom. Church one sponsor, or at most two of different sexes, is required.

**Spontaneous Combustion**, burning which takes place without the application of any igniting agent. Combustion is generally a form of oxidation in which sufficient heat is produced to render the particles of the material incandescent. The mere contact of atmospheric oxygen with a substance is not usually sufficient to produce chemical combination; a certain temp. or the presence of oxygen in a particularly active form is essential. In cotton-waste impregnated with oil, oxidation may proceed slowly until sufficient heat has been generated to cause it to burst into flame. The temp. necessary to produce flame varies with different substances. Thus carbon bi-sulphide vapour is ignited if the temp. rises to 150° C., which is insufficient to produce incandescence in most other bodies. Phosphorus, again, in a finely divided condition, combines with oxygen with the evolution of light and heat at ordinary temps. The conditions necessary for S. C. are the presence of a substance with a low temp. limit for flame, and a source of heat, such as slow oxidation, which eventually reaches that limit. Thus a heap of damp hay may burst into flame through the gradual rise in temp. caused by fermentative processes.

**Spontaneous Generation**, see ABIO-GENESIS.

**Spoonoon**, see PIKE.

**Spoonbills**, sub-family Plataleinae in the ciconiiform family Ibisidae and closely related to the ibises. They are characterised by their curious bills, which are long and flat, and are dilated at the end into the shape of a spoon. Their feet are adapted for wading, and the birds obtain their food, consisting chiefly of fish, frogs, molluscs, and crustaceans, from shallow water. The spoonbill is found in Europe and Central and S. Asia, and is a visitor to E. England, where it formerly bred.

**Spoonerism**, accidental transposition of initial letters or syllables of two or more adjacent words. It owes its name to the Rev. W. A. Spooner (1844-1930), warden of New College, Oxford. Instances are 'Kinkering kongs their tables tike', for 'Conquering kings their titles take'; 'Will nobody pat my hiccup' for 'Will nobody pick my hat up'; and 'You are occupying my pie' for 'You are occupying my pew.' While some of the most diverting, including the first cited, may be attributed to Dr. Spooner, most are apocryphal. See J. Huxley, *On Living in a Revolution* (essays), 1914.

**Spoons** of clay were used in the Neolithic period, and S. of bronze occur in the Early Iron Age, but in all probability these were of ritual and not utilitarian use. There are two chief types of Rom. S.; those for

table use have long tapering points at the and opposite the bowl for the removal of shell-fish from the shell, and others with long tapering bowls are for the removal of ointments from slender glass phials. S. were commonly in use in antiquity, and many Rom. and Saxon examples of metal are known; many others of horn or wood must have perished, and the name spoon, from the Saxon *spōn*, a chip, is a reminder that early S. were of wood. Folding S. were in use in medieval times when personal sets were customary. There was considerable variety in metal, decoration, and shape. The form of spoon now in use came into fashion about 1750-60. See also APOSTLE SPOONS.

**Sporades**, group of is. in the Aegean Sea, see GREEK ARCHPELAGO.

**Sporadic**, in medicine, term applied to diseases which occur in scattered cases, although their usual incidence is epidemic. S. cases often differ in a marked manner from epidemic cases.

**Spore**, minute, one-celled embryoless body, by means of which the flowerless plants or Cryptogams chiefly reproduce themselves, as distinct from the Spermatophytes or Phanerogams, which produce many-celled seeds, each of which contains an embryo plant. The div. between the two groups is more artificial than the older systematists supposed, and the pollen-grains of the Phanerogams are homologous with the microspores (the smaller of the two kinds of S.) of the higher Cryptogams, as is the embryo sac with the megaspore (or larger S.). A S. is in general an asexual reproductive body; the vesting zygotes of algae and fungi are known as zygospores. In large numbers of the fungi the S. are formed in huge numbers, as, for instance, in the 'puff balls' which shoot out a cloud of S. when compressed. Bacteria produce S. when conditions are unfavourable to vegetative reproduction and they can resist high temp. and poison, while they often retain their vitality for many years.

**Sporozoa**, large and important class of microscopic unicellular parasitic animals (Protozoa, *q.v.*), so called on account of the readiness with which they break themselves up into reproductive spores. The majority of them are minute, but their poisonous products give rise to deadly diseases in man and animals. The prin. groups of S. are the gregarines, the coccidians, and the haemosporidia. One of the best-known gregarines is *Monocystis* which is very common in the great white spermatic sacs of the earthworms. In its younger stage, as an oval uncelated body, it penetrates the male spermatic sac. There it comes side by side with another, and when they have adhered they form a glass-like cyst. Gametes are formed inside the cyst; they fuse in pairs and each zygote forms a boat-shaped sporocyst. The latter divides into eight sporozoites, which remain unchanged until swallowed by another earthworm, when their life hist. begins again. Gregarines occur only in invertebrates. Coccidians are found in mice, rabbits, frogs, insects, molluscs, and lower animals. They reproduce by

splitting and by the formation of spores after fertilisation by true spermatozoa. These two distinct processes of multiplication occur also in the haemosporidia, a group of blood parasites, one of which causes malaria. This is known as *plasmodium* (*q.v.*). See MALARIA.

**'Sporting Times'**, sporting and theatrical weekly, known as the 'Pink 'Un', founded in 1865 by Dr. Shorthouse, and ceasing pub. in 1932. Its political tone in its earlier years was avowedly Tory. With it became incorporated 'The Looking Glass' and 'The Man of the World'. A notable feature was its theatrical notes. The paper invented the term 'Ashes' (*q.v.*) in cricket.

**Sports**, see ATHLETICS; BALL GAMES OF (and separate articles on such games); CYCLES AND CYCLING; ROWING; RUNNING AND HURDLING; TRACK AND FIELD SPORTS, etc.

**Sports, or Mutations**, see VARIATION, IN BIOLOGY.

**Sports, Book of**, name given to a proclamation of James I. in 1618, dictating games lawful to be played after church on Sundays. The sports permitted were dancing, archery, vaulting, running, leaping, May-games, etc., and those prohibited were dramatic interludes, bear and bull baiting, and bowling. In 1644 this book was ordered to be publicly burned by decree of the Long Parliament.

**Spotsylvania Court House**, now generally known as Spotsylvania, post vil., cap. of a co. of the same name, in Virginia, U.S.A., 11 m. S.W. of Fredericksburg, and 55 m. N. by W. of Richmond. In 1861 it was the scene of engagements between the forces of Grant and Lee. Pop. 9900.

**Spottiswoode, Alicia Anne** (1810-1900), became Lady John Douglas Scott by marriage (1840). She is remembered chiefly as the composer of *Annie Laurie*, pub. anonymously in Paterson and Roy's *Vocal Melodies of Scotland* (1838), and as the composer or transcriber of *The Banks of Loch Lomond*.

**Spottiswoode, William** (1827-83), Eng. mathematician, the son of Andrew S., partner in the firm of Eyre and Spottiswoode. Wm. S. succeeded his father as queen's printer in 1846. Having graduated at Balliol College, Oxford, he became eminent as a mathematician and physicist. In 1853 he was elected a fellow of the Royal Society, and in 1878 president. Among his works are *Meditationes analyticae* (1847); *The Polarisation of Light* (1874); and *A Lecture on the Electrical Discharge, its Form and Function* (1881).

**Spot-welding**, see under WELDING.

**Sprain**, wrenching of a joint, causing stretching or laceration of the ligaments. The most commonly sprained joint is the ankle, owing to the inelasticity of the lateral ligaments. The immediate effects of S. are pain and loss of power in the joint. Swelling soon takes place and renders investigation of the extent of the damage difficult. Where fracture is suspected the joint should be treated for that, as treatment for fracture is generally appli-



## Sprat

cable to S. also. In ordinary S. swelling may be lessened by the application of cold water immediately after the injury. After the joint has swollen, however, hot water should be employed to ease the pain. The part should be well bandaged and rested.

**Sprat**, or *Clupea Sprattus*, small member of the herring genus common around the Brit. Isles. It is from 3 to 6 in. long, with smooth scales and prominent lower jaw. It may be distinguished from young herring by the absence of teeth on the vomerine bone and by having only one air vesicle in the ear. The S. is a favourite food-fish in mid autumn. Larger S. are extensively tinned and sold as 'bristling.'

**Spray Painting**, see under PAINTING AND DECORATING.

**Spree**, riv. of Germany, rises in E. Saxony on the borders of Bohemia, and winds N.E. through Brandenburg for 226 m., till it falls into the Havel at Spandau. It expands into numerous lakes and is connected by canal with the Oder.

**Spremberg**, tn. of Brandenburg, Germany, on the Spree, 15 m. S. of Kottbus. Manufs. include textiles and machinery. Pop. 13,300.

**Sprengel**, Hermann Johann Philipp (1834-1906), (Ger. chemist and physicist, b. near Hanover. In 1859 he settled in England, first at Oxford and later in London. His name is connected with the invention of the 'Sprengel pump' (1865) and the 'Sprengel tube' for the accurate testing of sp. gr.

**Spring, Howard** (b. 1889), Brit. novelist, b. in Cardiff, became a journalist, and in 1931 book critic of the *Evening Standard*. He is now reviewer for *Country Life*. His realistic novels, usually describing a wide selection of people, show good description of setting and background, and a feeling for characterisation, particularly of the working class. They include *The Shabby Tiger* (1935); *Rachel Rosier* (a notable character in the previous novel, 1936); *O Absalom* (1938; republished as *My Son, My Son*; filmed and trans. into sev. languages); *Fame is the Spur* (1940; filmed); *Hard Facts* (1941); and *Dunkirkers* (1946). *Darke & Co.* (1932), *Sampson's Circus* (1936); and *Tumbledown Dick* (1936) are children's books; and S. has pub. the autobiographical *Heaven Lies About Us* (1939); *In the Meantime* (1942); and *And Another Thing* (1946).

**Spring, Tom** (1795-1851), Eng. pugilist, the champion of England in 1824, in which year he twice defeated Jack Langan.

**Spring**, first season of the year, which is assumed to begin in the N. hemisphere at the vernal equinox (March 21), when the sun enters the sign of Aries, and to end at the summer solstice (June 22). See SEASONS.

**Spring**. Where rain falls upon pervious strata, such as chalk or sand, or upon jointed and broken strata, it sinks through until its further progress is arrested by an impervious stratum, e.g. clay. Above this stratum the rain-water then moves underground to the lowest point at which the impervious layer outcrops and there escapes in the form of a S. If the water supply is constant the S. is termed 'peren-

## Spruce

nial,' and where the supply is variable it is called 'intermittent.' Deep-seated waters become heated in their underground course and give rise to hot S. like those of Buxton, Bath, Matlock, etc. Underground waters have also a solvent action upon the rocks due to the presence of carbonic acid in solution, and may then issue forth as mineral S. These S. may be classified according to their contained salts, as saline, chalybeate, sulphurous, siliceous, etc. See also ARTESIAN WELLS; GEYSERS; MINERAL WATERS.

**Spring Balance**, see BALANCE.

**Springbok**, or *Gazella euchoe*, beautiful antelope found in central and S. Africa. It is of a tawny-red general colour with a white under-surface and head, and obtains its name from the long distances it can leap.

**Springer**, see under SPANIEL.

**Springfield**: 1. Par. of Essex, England, 1½ m. E.N.E. of Chelmsford, to which, in 1907, part of it was transferred. Pop. 600. 2. Cap. of Illinois, U.S.A., and co. seat of Sangamon co., 185 m. S.W. of Chicago, in the centre of an important farming, horse-breeding, and coal-mining region. Manufs. include soap, flour, watches, lumber products, engines, woollen goods, etc. S. has a fine state capitol and arsenal, and a monument to Abraham Lincoln, who lived and is buried here. Pop. 75,500. 3. Co. seat of Hampden co., Massachusetts, U.S.A., on the Connecticut R., 98 m. W.S.W. of Boston. Here is the Y.M.C.A. college and the Amer. international college. The U.S. armoury (1794) is here, and there are manufs. of firearms, machinery, paper, rubber and celluloid goods, cottons, woollens, and electric and motor cars. Pop. 149,600. 4. Co. seat of Clark co., Ohio, U.S.A., 45 m. W. of Columbus. Here is the Lutheran Wittenburg college. The tn. manufs. agric. implements, motor trucks, and flour. Roses are cultivated, and magazine printing is important. Pop. 70,700. 5. Co. seat of Greene co., Missouri, U.S.A., 200 m. S.E. of Kansas city. There are railway workshops, and farm produce is processed. Pop. 61,200.

**Springhill**, tn. of Cumberland co., Nova Scotia, Canada, 75 m. N.N.W. of Halifax. It has extensive coal-mines. Pop. 6000.

**Springs**, tn. of the Transvaal, S. Africa. 20 m. E. of Johannesburg. Gold was discovered in 1933, and ann production is valued at about £32,000,000, from thirty large mines. Coal is also mined, and a variety of industries includes engineering, chemicals, food, glass, lumber, bricks and fertilisers. The production of helical springs and ventilation equipment is noteworthy. Pop. 116,500 (including 25,600 Europeans and 83,400 natives) (See illustration, p. 6.)

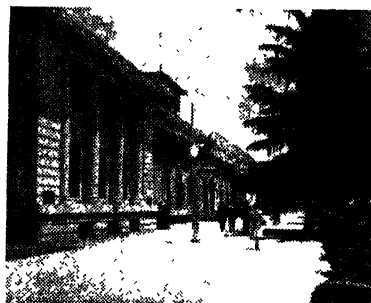
**Spring-tails**, see COLLEMBOLA.

**Sprinklers**, Automatic, see under FIRE BRIGADES.

**Sprinting**, see under RUNNING AND HURDLING AND ATHLETICS.

**Spruce**, term applied to various coniferous trees in the genera *Picea* and *Tsuga*. Both *P. excelsa*, the S.-fir or Norway S., and *T. canadensis*, the hemlock S., are

valued on account of their wood, and their products of resin, turpentine, and pitch. Aircraft construction has provided a new use for the wood and encouraged increased cultivation. Black S. (*P. nigra*) is used in the manuf. of paper pulp.



South African Railways  
SPRINGS: THE TOWN HALL

**Spruce Beer**, alcoholic beverage used in Canada, and prepared by fermenting sugar solutions and essence of spruce with yeast.

**Spur**, apparatus fastened to the heel of a horseman for goading the horse, the modern variety usually consisting of small sharp-pointed wheels called rowels. In the days of chivalry the use of the S. was limited to knights, and it was among the emblems of knighthood, and still forms part of the Brit. regalia.

**Spurge**, see EUPHORBIA.

**Spurge Laurel**, see DAPHNE.

**Spurgoon**, Charles Haddon (1834-92), Eng. preacher, b. at Kelvedon, Essex, the son of an Independent minister, joined the Baptists in 1850, of which sect he became an active member. He was pastor of Waterbeach, Cambridgeshire, in 1852, but he soon was transferred to Southwark, London. His sermons at Exeter Hall crowded the building, and he became minister of the great Metropolitan Tabernacle when it was opened in 1851. He was the most popular preacher of his day. His autobiography was pub. posthumously (1897-1900). See also W. Williams, *Personal Reminiscences*, 1895; and lives by W. Y. Fullerton, 1921; J. C. Carlile, 1933; A. Hoefs, 1934; and A. Roth, 1934.

**Spurn Head**, promontory at the S.E. extremity of Yorkshire, England, on the estuary of the Humber. Since the erection of groynes in 1864 the inroads of the sea have been checked. There are two lighthouses.

**Spurs**, Battle of the, see COURTRAÏ (Belgium), GUINEGATE (France).

**Sputum**, matter ejected from the mouth in spitting. It consists usually of saliva mixed with a mucus from the nasal passages and fauces. In morbid states of the respiratory passages it may contain blood, purulent matter, and the debris of diseased surfaces.

**'Spy,'** see WARD, SIR LESLIE.

**Squadron**. In the R.N. the term is applied to administrative groups of battleships, battle-cruisers, cruisers, or aircraft carriers either working separately or attached to fleets and commanded by junior flag officers. Similar groups among smaller vessels are known as flotillas. In the Brit. army the S. is a body of cavalry or armoured troops forming a sub-div. of a regiment. Three or more S. compose a regiment, each under the command of a captain or of a major assisted by a captain. Each S. is divided into three or four troops, each commanded by a subaltern officer. In the U.S. Army a S. is a unit of size corresponding to a battalion, divided into troops each the size of a Brit. S. and again subdivided into platoons. This is the organisation for U.S. cavalry proper and for light armoured troops, but not for tanks. The word is of It. origin and means a 'square' battle formation of companies of infantry or troops of cavalry in close order. The S. is the smallest operational unit of the R.A.F. and consists of a number of aircraft and flying and ground personnel. The number of aircraft employed and the rank of the commanding officer vary according to the role of the S. The commanding officer is usually either a S. leader or a wing commander.

**Squall**, sudden strong wind usually associated with a change of direction; frequently there is also heavy rain, a sudden rise of pressure and fall in temp. In a line-S. which moves in a line across a large area, the wind shift and fall of temp. may be considerable, and much of the chance may be permanent. In an isolated thunderstorm the wind and rise in pressure may only be very temporary, but frequently the fall in temp. remains permanent. A line-S. is usually associated with a cold front (a cold air mass replacing a warm one), and it carries with it its own typical roll cloud. The S. is due to the increase in unstable conditions caused by the warm air being held up by friction at the surface and being overrun by colder air. As the rain from the warmer air higher above the front falls into the cold air, it evaporates and cools the cold air even more by absorbing latent heat from it; if this cold air has trapped some warm air more violent instability is produced, and the down-flowing cold air attains a great velocity; this is the S. wind. The convection may be so violent that sometimes a vortex is set up, when a funnel cloud appears as in the waterspout or tornado.

**Square Measure**, see under WEIGHTS AND MEASURES.

**Square-rig**, rig of a ship whose prin. sails are extended on yards suspended horizontally at the middle, and can be set on either side at a greater or less angle with the keel, but not on one side as a fore and aft sail. See SAILS AND RIGGING.

**Square Root**, see INVOLUTION.

**'Square, The,'** see NORMA.

**Squaring the Circle**, see QUADRATURE.

**Squash**, popular name given to a variety of *Cucurbita Pepo*, the pumpkin. It is closely related to the vegetable marrow, and is edible.

**Squash Racquets**, offshoot of racquets (*q.v.*) or rackets, which has outstripped its parent in popularity in the twentieth century, partly because it is less costly. It differs from racquets in the following ways: (1) The court is much smaller, being only 32 ft. long and 21 ft. broad. The height of the 'service' line is 6 ft., and the top of the 'board' (*i.e.* the play line, sometimes also called the 'tin') is 19 in. from the ground. Other measurements are, of course, in ratio. The floor is of wood, and sometimes the side and back walls also. (2) The ball used is of india-rubber and hollow (except in the U.S.A., where a solid rubber ball is used). Its size is a little larger than a racquets ball. (3) The racquet is lighter and 3 in. shorter than that used in racquets. Its length may not exceed 27 in. (4) The scoring, in the Brit. game, is up to 9 instead of 15, with the option at 8-all of 'no-set' or 'set-two' (*i.e.* up to 10) on the part of the player who reached 8 first. As at racquets, points can only be scored when 'in hand' (*i.e.* serving); but in the U.S.A. scoring is up to 15, with points scored whether 'in hand' or not.

S. R. originated in England, and was probably first played at Harrow. Until 1890 the game was played almost exclusively at public schools. Since then its popularity has increased quickly, and it is now played (by both men and women) in many different parts of the world. The game was first standardised in Britain in 1922, and the central S. R. Committee was formed, later to become the S.R.A. (Squash Rackets Association), of which women now have their own branch. There are innumerable competitions throughout the country, the greatest being the Open Championship, instituted in 1930. The holders have been C. R. Read (Queen's Club, professional champion) 1930; D. G. Butcher (Conservative Club, professional champion), 1930-31; F. D. Amr Bey (amateur champion), 1931-37; J. Dear (Prince's and later Queen's Club, professional champion), 1938; M. el Karim (Gezira Sports Club, professional), 1946; A. E. Biddle (professional champion of the Brit. Isles), 1948; M. el Karim, 1949.

There is also a doubles form of the game, played in a somewhat larger court, 45 ft. long and 25 ft. wide. The service line is 8 ft. 2 in. high, but the board is lower than that in the singles court, its top being only 17 in. from the ground. S. R. is a game requiring great skill and great stamina. In fact it requires no less skill and considerably more stamina than racquets, but owing to the soft ball it lacks the speed and exhilaration of the older game. See J. T. Hankinson, *Squash Rackets*, 1949.

**Squid**, see CEPHALOPODA.

**Squill**, see SCILLA.

**Squilla**, genus of stomatopod crustaceans. *S. mantis* is common in the Mediterranean, where it is used as food, and is occasionally taken off Brit. coasts. It is about 7 in. long, and the carapace covers only eight of the segments, those uncovered bearing the eyes and antennules.

**Squint**, or **Hagioscope**, slanting aperture cut through the walls of the chancel in

certain medieval churches, so as to make the elevation of the Host visible from a side chapel.

**Squinting**, or **Strabismus**. In correct vision the axes of both eyes correspond in direction and turn towards the subject looked at. The motor muscles so act that any movement of one eye causes a harmonious movement in the other. Sometimes the axes of the eyes are not parallel and the eyes do not move harmoniously together, this defect being known as S., or strabismus. It may take place upwards, downwards, inwards, or outwards; both eyes may be affected, or it may be confined to one. S. usually occurs in childhood, being caused generally by some defect in the muscles or nerves of the eye. Convulsions, teething, fevers, shock, etc., can be precipitating conditions. Another common cause is either short or long sight, and the squint can then be remedied by spectacles alone. A new branch of ophthalmic optics known as orthoptics is now correcting many forms of squint by exercises designed to stimulate weak muscles or nerve reactions in one or both eyes. In some cases operative treatment is necessary. In adult life there can occur a form of squint arising from paralysis of one or more of the external eye muscles. See Gibson, *Clinical Orthoptics*, and G. H. Giles, *The Practice of Orthoptics*, 1943.

**Squire**, Sir John Collings (b. 1884), Eng. author and critic, b. at Plymouth, educated at Blundell's School and at St. John's College, Cambridge. In 1913 S. became literary editor of the *New Statesman*, and was its acting editor 1917-18. In 1919 he founded and ed., until it ceased in 1934, the *London Mercury*, a monthly magazine of literature and the arts. S. early took his place among the pre-1914 'Georgian' group of poets, but much of his poetry covers the period of the First World War. The best of many vols. of poetry was collected in 1926 in *Poems in One Volume*. Most of S.'s critical work, which is informative, catholic, and kindly, appeared first in periodicals, and has since been collected under his own name (*Books Reviewed*, 1922; *Sunday Morning*, 1930) and under a pseudonym, Solomon Eagle (*Books in General*, 1918, 1920, and 1921). S. is also a clever parodist (*Collected Parodies*, 1921). As editor he revived the Eng. Men of Letters Series, and ed. Freeman's and Flecker's poems, also *Selections from Modern Poets*, and *A Book of Women's Verse*, and was joint editor of the Eng. Heritage Series. S. has done invaluable work for the preservation of notable buildings (honorary secretary Stonehenge Preservation Society and chairman of Architecture Club, 1922-1928). From 1926 to 1929 he was chairman of the Eng. Association. Other books: *Socialism and Art* (1907); *The Gold Tree* (stories, 1918); *Life and Letters* (1920); *Essays on Poetry* (1923); *The Grub Street Nights Entertainments* (stories, 1924); (ed.) *The Comic Muse* (anthology, 1925); *A Face in Candlelight* (poems, 1933); *Outside Eden* (1933); *Reflections and Memories* (1935); *Weepings and Wailings* (1935); *Water Music* (1939); *Poems of*

*Two Wars* (1940); and *Selected Poems* (1948). See I. A. Williams, J. C. Squire, *A Bibliography of his Works*, 1922.

**Squire**, abbreviated form of esquire. Originally a S. was the armour-bearer of a knight, to whom he was next in rank, and had various privileges and exemptions. It later became popularly applied to the chief landowner in an Eng. country dist.

**Squirrel**, or *Sciurus*, genus of arboreal rodents. *S. vulgaris*, the European S., is widely distributed over Europe and parts of Asia. Of this the Brit. S. is a subspecies, restricted to the Brit. Is. The body is reddish-brown above and white below; the ears are large and tufted. The body is about 8 in. long, and the bushy tail only an inch shorter. It feeds on fruits and shoots, and sometimes eggs and small birds. It has been destroyed in large numbers in Scotland on account of its habit of barking and otherwise damaging forest trees. In the S. of England it is driven away from its haunts by the introduced grey or Canadian S. (*S. carolinensis*) which has adapted itself with remarkable readiness. Males of this species are, however, in great preponderance. Its coat is grey, and its head bears resemblance to that of the rat. The African ground or spiny S. belong to the genus *Xerus*. The Flying S. (*Pteromys*) of the Orient are remarkable for the possession of a membrane stretching from fore to hind limb, whereby they can glide for distances up to 80 yds.

**Srinagar, Serinagar, or Cashmere**, cap. of the important frontier state of Jammu and Kashmir (q.v.), N. India, on R. Jhelum, 115 m. N.E. of Rawal Pindi. It is beautifully situated in a valley at an elevation of 5276 ft. Formerly the summer cap. of the Moguls, it has many interesting features. In 1947 it was occupied by Indian forces. Pop. 207,800.

**Srirangam, or Seringham**, tn. in Madras, India, on an is. on the Kaveri R., 2 m. N. of Trichinopoly. It contains a temple of Vishnu. Pop. 27,000.

**S.S. Troops**, see S.A. and S.S.

**Szu-Ma-Ch'ien**, see under CHINA, *Chinese Literature*.

**Ssumao, Sumao, Semaio, Ssemiao**, or *Esmote*, tn. of S. Yunnan, China, 185 m. S.W. of Yunnanfu. The centre of the trade in Puerh tea.

**St.** (in the case of geographical names), see SAINT.

**Stabat Mater**, well-known Lat. hymn on the seven sorrows of Mary, so called from its opening words. In the Rom. Missal it forms the sequence for the feast of the Seven Dolours of the Blessed Virgin Mary. The author was probably Jacopone da Todì. There are many musical settings.

**Stabiae**, anct. seaport tn. of Campania, Italy. The modern Castellammare is near its site. It was buried by the eruption of Vesuvius, together with Pompeii and Herculaneum, in A.D. 79. Pliny the Elder met his death here.

**Stabilisation** (exchange rates), financial policy of counteracting wide fluctuations in the relative value of monetary units. The world-wide economic depression of 1930-32 brought the subject under dis-

cussion at the World Economic Conference in London in 1933, but with no practical results. Formerly, monetary units had a known value which was based on the gold standard. S. of exchange rates after the Second World War was the aim of the Bretton Woods Agreement (1948), by which the International Monetary Fund was set up, which began work in 1947. By the agreement, fixed exchange rates of the other currencies (*par values*) are to be estab. with the dollar (and this indirectly with gold since the dollar has still a fixed value in gold); changes in par values (with certain exceptions) require the approval of the Fund, which was obtained for the devaluation of Sept. 1949. Real S. requires freedom of exchange restrictions; not much progress has so far been made in this direction. S. of exchange rates, to be effective without exchange restrictions is dependent on internal financial stability, i.e. avoidance of inflation. Much progress towards this goal has been made in W. Europe since the beginning of Marshall Aid.

**Stability**, property by which a structure tends to maintain its original position, and by which a moving system tends to recover its typical configuration when slightly disturbed. In mechanics *static S.*, or stable equilibrium, is possessed by a body when, if it is slightly displaced from its position, the forces acting on the body tend to make it return to its original position. Thus a book lying on its side is in stable equilibrium, but a thin book standing on end is in unstable equilibrium. When a body tends to remain in the new position without further movement it is said to be in neutral equilibrium; example: a sphere resting on a horizontal plane. The condition of S. is that the centre of gravity shall be as low as possible. In *kinetic S.* motion has to be considered. A system is said to be in equilibrium when the general configuration is maintained in spite of small occasional disturbances; e.g. a spinning top, a rolling wheel.

**Staccato** (It. detached), special manner of performing musical phrases without slurring the notes together, articulating each separately. The S. actually shortens the value of each note as written by the insertion of a minute pause, so that, for example, crotchets marked S. become something like dotted quavers followed by a semiquaver rest. The notation of S. is a series of dots placed over each chord or note to be so performed.

**Stachys**, genus of labiate plants, containing over 200 species. These are worldwide in distribution, except for Australasia, and the Brit. species are known as hedge-nettle or woundwort. *S. Betonica* is the Brit. wood betony, *S. sylvatica* the hedge woundwort (with foetid leaves), and *S. palustris* the marsh woundwort. *S. Sieboldi* produces a large number of small white tubers, which, under the name of *crosnes*, are often eaten.

**Stade**, tn. of Hanover (Lower Saxony), Germany, near the mouth of the R. Schwine, 22 m. N.W. of Hamburg. Industries include iron-founding, ship-building, and the manuf. of lace, cloth,

and flannel. It was a Hanseatic tn., and belonged to Sweden, 1648-1719. Pop. 15,100.

**Stadholder**, or **Stadtholder**, corrupt form of the Dutch *stad-houder* (stead-holder), a title formerly applied to a royal lieutenant or viceroy of a prov., who was also a chief magistrate. It became a hereditary title in the House of Orange.

**Stadium**, Gk. measure of length, equal to 600 kti. ft., and 582.5 ft. Eng. measure. In the time of the Rom. Empire 7½ stadia, or 4732 Eng. ft. went to a mile. The standard was the length of the Olympic stadium, i.e. the oblong course over which foot races were run (see OLYMPIAD).

In modern times the S. has come to mean an athletic ground, and emphasis is laid not on the original distance of the course, but on the accommodation for spectators.

**Stael**, **Madame de** (1766-1817), or **Anne Louise Germaine Necker**, **Baronne de Stael-Holstein**, by marriage in 1786, Fr. novelist and essayist, b. at Paris, was the daughter of Necker, the celebrated financier. From the first a precocious child, she pub. her famous *Lettres sur Rousseau* (1789) when scarcely twenty-three years old. In 1792 the revolution forced her to leave France, and for some years she travelled, visiting Switzerland, England, Germany, and Italy, writing her *Recherches sur la paix intérieure* (1795) and *De l'influence des passions* (1796). A quarrel with Napoleon against whom she intrigued constantly led to her exile (1803) and she removed to Weimar, where she met and studied literature with Schiller and Goethe, and later to Berlin, where she met August Schlegel (q.v.), who lived at her home on Lake Geneva after 1804. In Italy she wrote *Corinne*, her masterpiece (1805). After returning to France in 1810 she was again exiled in 1810, and had to seek refuge in Russia, Sweden, and London, where her *De l'Allemagne* (which, when going to press in 1810, was seized by the Russian police) (1813) gained her access to intellectual circles. In 1814 she was welcomed to Paris by Louis XVIII., but her health gradually gave way under the strain of nursing her delicate second husband, whom she had secretly married at Geneva (1811). Before her time Ger. literature was unknown to France. Her complete works were ed. by Mme Necker de Saussure (1820-21). The Fr. attitude towards it was summed up in Voltaire's gibe at the Gers, who 'wanted more wit and less consonants.' Her *De l'Allemagne* overcomes Fr. prejudices and abandons the sensualist point of view of eighteenth-century philosophy. See lives by M. Norris, 1853; A. Stevens, 1881; A. Sorel (Eng. trans.), 1892; also C. A. Sainte-Beuve, *Portrait des femmes*, 1869; A. C. P. Haggard, *Mme de Stael: Her Trials and Triumphs*, 1922; R. McN. Wilson, *Germaine de Stael: the Woman of Affairs*, 1931.

**Staffa**, small is. of the Inner Hebrides, Argyllshire, Scotland, lying 7 m. W. of Mull and 6 m. N.E. of Iona. Its circumference is about 1½ m. Geologically it is composed of volcanic tufa and trap rock.

or basalt, and is remarkable for its numerous caves, where the latter rock appears in beautiful prismatic and columnar forms. The most famous are Fingal's Cave, Clamshell Cave, McKinnon's or Cormorant's Cave, and Boat Cave.

**Staff, Air**. The present R.A.F. Staff is descended from a combination of the staffs of the R.F.C. and the R.N.A.S. which were amalgamated into the R.A.F. on April 1, 1918. The Air Council is the governing body of the R.A.F. and is charged at Parliament with the administration of the R.A.F. and with defence of the Realm. It consists of the secretary of state for air, the parliamentary under-secretary of state for air, the chief of the air staff, the vice-chief of the air staff, the deputy chief of the air staff, the air member for personnel, the air member for supply and organisation, the air member for technical services, and the permanent under-secretary of state for air. Each member of the Air Council has an appropriate staff working under him at the Air Ministry. The Air Ministry issue instructions and directives to the various air officers commanding-in-chief at home and R.A.F. commanders-in-chief overseas, to whom is delegated a considerable amount of authority. In their turn commanders-in-chief raise matters for decision by the Air Ministry. The air officers commanding-in-chief and commanders-in-chief have at their headquarters their own air, technical, and administrative staffs, and administer smaller headquarters and units (e.g. stations, training establs.). Officers are trained in staff duties at the R.A.F. Staff College, Joint Services Staff College, and Imperial Defence College. They are, however, only employed on staff duties for limited periods—at other times they carry out their normal work of flying, administration, or technical duties.

**Staff College, Camberley**, in Surrey. The Army S. C. designed to train selected officers for the staff and later for appointments in command. Officers here study the intricacies of the science of warfare and discuss and practice the tactical handling and administration of large formations composed of all branches of the army. Co-operation with the R.N. and the R.A.F. is an essential feature of the instruction. In addition to the purely military studies, emphasis is placed on broadening officers' general knowledge. During the course, which lasts one year, visits are paid to both military establs. and civilian firms and newspapers. Lectures are given throughout the year by senior officers of the services, gov. ministers, and other prominent men. All officers who graduate from the S. C. have the letters 'p.s.c.' placed after their names in the Army List.

**Staff College, Joint Services**, opened early in 1947 at Latimer House, Chesham, Buckinghamshire, England. It has about 100 students chosen from the R.N., the Army, the R.A.F., the home civil service, and the dominions. Officers normally attend this college at some period after passing through their respective S. Cs.

Each course lasts about six months. The syllabus covers the activities of all three services and of gov. direction in wartime, and is designed to qualify officers for appointments on joint staffs and for higher staff appointments in their own services. The directing staff of the college is drawn from all three services, the commandant being found by each service in rotation. The college develops mutual understanding and a common doctrine between the services, and evolves a standardised system of staff work. Among the subjects studied are the organisation and capabilities of the three services, imperial strategy, the study and analysis of inter-service and joint operations, and the planning and execution of joint operations of all kinds. Such subjects as weapon and equipment development, scientific warfare, military geography, the machinery of war production and modern production methods, and the governmental and central direction of war are also included in the syllabus.

**Staff Colleges,** military colleges open to officers of all arms, including the Royal Marines, maintained by the gov. for the purpose of affording selected officers instruction in the higher branches of the art of war and in staff duties (see STAFF, MILITARY). A limited number of officers of the permanent staff or permanent forces of Canada, Australia, New Zealand, and S. Africa, and certain other countries selected by the govts. of those countries may be permitted to undergo the course. Twenty-four vacancies are annually filled by competition and eight by nomination. See preceding article.

**Staff, Military.** The S. of an army formulates the plans and transmits the orders of the commander-in-chief and co-ordinates the operations of subordinate commanders. It is composed of a number of specialised elements, usually all under a chief of S. S. now are of two kinds: (a) those at the War Office (g.v.) (or equivalent depts.), which are in being during peace and war, and (b) those which are formed to accompany a field army during active operations. In the latter case the lower formations such as divs. and brigades maintain S. during peace which accompany these formations on active service.

**British Army.**—The first example of an organised S., with mainly administrative duties, of which we have detailed knowledge, is that of the new model army, based on the practice of Gustavus Adolfus as perfected by the Prussians. It was controlled by the sergeant-major general under the Capt-Gen. Sir Thomas Fairfax. This S. was capable of transmitting written administrative orders, but its operational plans were not committed to paper and operation orders were given by word of mouth, either direct to commanders or through aides-de-camp.

The greater complexity of military organisation and the multiplicity of arms led to the issuing of written operation orders and to the formation of the 'G' (general) branch of the S. which is now subdivided into operations, intelligence, and S. duties (allocation of officers and

personnel), and takes precedence over the older 'A' (adjutant general) and 'Q' (quartermaster general) branches. Artillery and engineers maintain separate S. at headquarters the commanders of which, in addition to their duties as commanders of their own arms are advisers to the force headquarters commander on all matters affecting their arms. Orders for operations are received from the 'G' branch and for administration and supply from 'A' or 'Q' branches respectively.

In the Brit. Army a system of alternating command and S. employment operates so that all S. officers have regimental experience, and some regimental officers and most generals have S. experience. For practical purposes there is no general S. corps.

**French Army.**—The Fr. S. system which was widely adopted in E. Europe dates in origin from the reforms of Louvois (g.v.) about 1680. Besides the commander's personal assistant (*chef de cabinet*) there is a *chef d'état-major* controlling the whole S. which consists of *bureaux* as follows: 1<sup>er</sup> *bureau* (adjutant and judge-advocate); 2<sup>d</sup> *bureau* (intelligence); 3<sup>e</sup> *bureau* (operations); 4<sup>e</sup> *bureau* (quartermaster). Here also the system of alternating command and S. duties operates. Fr. S. are noticeably smaller, and S. appointments carry a lower rank, than in other armies.

**United States Army** (see also WAR DEPARTMENT, U.S.A.).—Before 1903 no permanent general S. existed in the U.S. Army, and the present S. system, which is uniform from the War Dept. down to regimental level, is essentially that laid down by the Defence Act of 1920. It bears certain resemblances to the Fr. system, largely owing to the experiences of 1917, but perhaps in part dating back to the days of Lafayette. Every formation and unit has a chief of S., and under him assistant chiefs of S. G. 1 (adjutant), G. 2 (intelligence), G. 3 ('executive,' i.e. operations), G. 4 (quartermaster), and latterly G. 5 (civil affairs or military government). Specialist corps for S. duties abound. Amer. S. officers rank relatively high; e.g. the A/C. of S., G. 2, at an Amer. corps is a colonel; at a Brit. corps a major is in charge of intelligence duties. The same system of S. duties obtains in regiments and battalions; but here the respective officers are known as S. 1, S. 2, etc.

**German Army.** In Prussia and in the Hohenzollern and Third Reichs was developed the general S. corps *par excellence*. Down to the dissolution of the Ger. Army in 1945 only general S. officers were given high command in the field (Rommel was an exception), and the army representatives on the O.K.W. (Combined Services Supreme Command) were almost exclusively drawn from this corps. Ger. S. organisation though smoothly working was elaborate and intricate. It was arranged in echelons rather than branches, each echelon designated by a Rom. figure. Thus the most forward S. echelon consisted of Ia (operations), Ib (adjutant), Ic (intelligence), Id (forward supply of ammunition, rations, etc.). These echelons

extended, with numerous subdivisions, far to the rear (*Rückwärtige Dienste*), and down to VI. The administrative branches of the S. were controlled not by army officers, but by War Office officials (*Wehrmachtsbeamten*) bearing titles such as *Stabsintendant* (major in charge of supplies), *Feldbischof* (senior chaplain), *Assistentenarzt* (medical officer, lieutenant), *Oberstzahlmeister* (lieutenant-colonel, pay corps).

**U.S.S.R.** (see also RED ARMY).—In general the Russian system conforms to the Ger., since it has been largely influenced by Ger. example, both in Russo-Ger. wars and by the loan of Ger. military advisers from the time of Peter the Great down to the late 1930s. The Russians have a general S. corps, and also some characteristic Ger. military ranks, such as colonel-general.

**Staff, Naval**, term used for the operational, as opposed to the administrative, S. of the R.N. Unlike the other two services, the administration of the navy is largely run by civilians and, before 1832, it was divorced from the Admiralty in a separate 'Navy Office' in Somerset House. Though, later, construction and material were brought under the Third Sea Lord as controller, and supplies under the Fourth Sea Lord, administration of the R.N. remained predominantly civilian. Only in 1941 was an administrative section under naval officers attached to the Plans Div. In 1882 the Naval Intelligence Div. was set up with a small group of officers, and became the nucleus of the future naval S. But its functions were purely advisory, its object being to collect and disseminate all information leading to operations of war. The organisation into which it developed was inadequate, and the Agadir crisis of 1911 revealed that naval war plans were virtually in the mind of the First Sea Lord, and that no attempt had been made to relate them with those of the army. With Winston Churchill as First Lord a properly constituted war S. was estab. in Jan. 1912. By the end of 1914 it comprised the Operations, Training, Mobilisation, and Intelligence Divs. Two years later the Anti-submarine Div. was created, and the First Sea Lord also became the chief of naval staff (C.N.S.), thus giving executive power to the war S. To-day (1950) the C.N.S. is assisted by the Fifth Sea Lord as deputy chief of naval staff (Air), together with a vice chief of naval staff and an assistant chief of naval staff, while the divs. of the naval S. include Plans, Operations (Sea and Air), Trade, Intelligence, Gunnery, Navigation, Under Water Warfare, Signals, and Training. The S. of commanders-in-chief are set up on a similar principle.

**Stafford, Henry**, see **NORTHCOTE, BARON**.

**Stafford**, municipal bor., mkt tn., and co. tn. of Staffordshire, England, on the R. Sow, 23 m. N.W. of Birmingham. Domesday Book mentions a castle, then in ruins, which William I. had built. In 1224 S. was granted an aid for enclosing the tn. with walls. Traces of the old walls are still to be seen, and the name still persists in two of the streets. The

present castle, 1 m. outside the tn., stands on the site of that built by Ralph, Baron S., in 1348, and destroyed in 1643. The earlier castles were inside the tn., i.e. on an entirely different site. Other notable buildings are St. Mary's Church, restored by Sir Gilbert Scott, containing a bust of Izaak Walton, a native of S.; the church of St. Chad; shire, tn., and co. council halls; the Technical School, Edward VI. Grammar School, and the co. school of arts and crafts. The chief industries are electrical engineering and the manuf. of boots and shoes. There are also locomotive engineering and suit works. Until 1918 the bor. sent a member to Parliament. Pop. (1948) 37,500.

**Staffordshire**, midland co. of England, bounded on the N.E. by Derbyshire, E. by Leicestershire, S.E. by Warwickshire, south by Worcestershire, S.W. by Shropshire, and N.W. by Cheshire. The surface generally is level, rising to hilly regions in the N. and south. The prin. hills in the N. are Axe Edge on the Derbyshire border, and Congleton Edge on the Cheshire border, while in the south lie the Rowley Hills. The chief riv. is the Trent, with its tribs., the Dove and Churnet. The co. includes the great iron and steel manufacturing dist. known as the Black Country, and the Potteries. There are four great coalfields, the Black Country being the most southerly, stretching from Birmingham to Wolverhampton, and including Walsall, Wednesbury, Dudley, and W. Bromwich; the Potteries occupy the N. coalfield, and include Stoke-upon-Trent, Hanley, Burslem, Longton, Fenton, and Tunstall; while Chaddle is the centre of the third coalfield and Cannock Chase is the fourth. Coal was first mined here in the thirteenth century; potteries were started in the eighteenth. Other industries are the breweries at Burton-on-Trent, chemical works, brick and tile works, paper-mills, and the manuf. of boots and shoes at Stafford, and the metal industries of the Black Country. Agriculture is carried on also, oats, wheat, and barley being grown, and there are dairy farms. Railway communication is good, the prin. centre being Birmingham, and the S. and Worcester, Trent and Mersey, and other canals serve the co. The co. is divided into six parl. divs., each returning one member. Stafford is the co. tn. and S. is in the Lichfield diocese. N. S. Univ. College (q.v.) was planned to serve the heavily populated area around Stoke-upon-Trent. S. was settled by the Romans, then occupied by the Welsh. Wall (*Lletocetum*) was a Rom. station; it is preserved as an anct. monument. Under the Eng. it formed part of the kingdom of Mercia, the Mercian kings having their residence at Tamworth. Besides the cathedral at Lichfield there are many beautiful par. churches, as St. Mary's, Stafford, and St. Peter's, Wolverhampton. There are also remains of castles at Stafford, Tamworth, Tutbury, and Chartley. Samuel Johnson and Izaak Walton were natives of S. Area 1164 sq. m. Pop. (1948) 1,586,700. See S. Shaw, *History of Staffordshire Potteries*, 1829; and *Victoria County*

**History:** *Staffordshire* (vol. 1.), 1908; W. Beresford, *Memorials of Old Staffordshire*, 1909; C. J. B. Masefield, *Staffordshire*, 1930; and P. Drabble, *Staffordshire*, 1949.

**Staffordshire Bull Terrier** differs from the modern bull terrier (*q.v.*) in sev. ways, and is a representative of the original fighting breed. Dogs weigh from 28 to 34 lb. The head is short and deep, the neck thick and muscular, the chest wide and deep, and the hindquarters light but strong. The coat may be any shade of red, fawn, black, or brindle, with or without white markings. The breed is unexcelled as a guard.

**Staffordshire Regiments, North and South.** *North Staffs.*—Formerly the 64th and 98th Regiments. The 64th, raised in 1756 as the 2nd Battalion 11th Foot, was made a separate regiment in 1758, and served in America, the W. Indies, and India. The 98th, raised in 1824, served in the Cape of Good Hope, China, and India. The two regiments were linked in 1881 to form the present regiment, which served in the S. African war, 1900–2. During the First World War it raised seventeen battalions, which served in France, Flanders, Gallipoli, Egypt, Mesopotamia, Persia, and N.W. Frontier of India. In the Second World War the regiment fought with the Eighth Army in Libya and throughout the It. campaign.

*South Staffs.*—Formerly the 38th and 80th Regiments. The 38th, raised in 1702, served in operations in the W. Indies, America, Cape of Good Hope, Monte Video, Peninsula, Crimea, and Indian Mutiny. The 80th, raised in 1793, served in operations in Flanders (1794), Cape of Good Hope, and the Zulu wars. The two regiments were linked in 1881 to form the present regiment, which served in the Egyptian, Nile, and S. African campaigns. During the First World War it raised eighteen battalions, which served in France, Flanders, Italy, Gallipoli, and Egypt. In the Second World War different battalions served in N.W. Europe, particularly at the battle of Arrhem, Sept. 1944, and as part of the Chindit force in Burma.

**Stafford Springs**, tn. of Tolland co., Connecticut, U.S.A., 25 m. N.E. of Hartford, on the Central Vermont railway. Manufs. include doekins and cassimere. Pop., including South Springs, 3400.

**Stag-beetle**, term applied generally to species of lamellicorn coleoptera in the family Lucanidae. The males are remarkable for the enormous development of their mandibles, which are sometimes equal in length to the rest of the beetle. The larvæ are fat white grubs which dwell inside the wood of trees, and do not become perfect insects until the lapse of about five years. Four kinds are found in Britain. The largest Brit. beetle is the common S. (*Lucanus cervus*), which is common around London.

**Stage**, *see* DRAMA; REPERTORY THEATRES; THEATRE.

**'Stage, The.'** leading newspaper of the theatrical profession, pub. weekly by Carson & Comerford Ltd., 19–21 Tavistock Street, W.C.2. Founded in 1880, its

present editor is the dramatic critic, S. R. Littlewood. *The S.* covers every branch of the entertainment industry, including drama, variety, repertory, concert, and music, and cabaret. In addition to reviews of the week's new plays and revivals, it contains articles and news of theatrical interest. *The Stage Year Book and Guide* is pub. annually.

**Stage Carriage**, defined by the Revenue Act, 1869 (replacing the corresponding provision in the Stage Carriages Act, 1832), as any vehicle, other than a railway carriage, used for the conveyance of passengers who are charged separate and distinct fares, or at the rate of separate and distinct fares for the respective seats. Under the Stage Carriages Act, 1832, a S. C. may not be used without the required numbers of passengers being painted on it. A horse tramcar (Brian v. Aylward) and an electric tramcar (Phesso v. Fisher, 1915) are S. Cs. A bus, privately hired for a journey from one place to another, is not a S. C. (M'Kee v. Weir, 1929). In bors. and other urb. dists., and in those rural dists. invested with the necessary powers under the Public Health Acts, S. Cs. that are hackney carriages within the Town Police Clauses Act, 1889, are seemingly subject to both sets of provisions. Throughout England S. Cs. are subject to the provisions of the Act of 1832 as amended by the London Hackney Carriages Act, 1833, the Railway Passenger Duty Act, 1842, and the Revenue Act, 1869. Within the metropolitan police dist. they are subject to special enactments. S. Cs. are not to carry either in the whole or inside or outside a greater number of passengers than it is constructed to carry as ascertained according to the relevant statutory provisions or than painted numbers specify. There are penalties for breach of these restrictions from £5 to £10 fine. In *Dennis v. Miles* (1924) a motor omnibus licensed in King's Lynn as a hackney carriage was held to be a S. C. outside that dist., and also a S. C. in King's Lynn. The effect of the Road Traffic Act, 1930, is that the above statutory provisions governing S. Cs. relate only to S. Cs. that are not motor vehicles or motor S. Cs., and that other public service vehicles (*q.v.*) are subject to regulations made under section 94 of the Act of 1930. According to the decision on appeal in the divisional court in the case of *Hunt v. Morgan* (Dec. 2, 1948) a disengaged cruising taxicab is not bound to stop and accept the passenger who hails it. There had previously never been a decision on this point, though there existed a widely held belief that a cabman, whether on the rank or not, was bound to accept a fare unless he had a reasonable cause for refusing. If, however, the driver actually solicits custom when cruising, it seems that he is guilty of an offence under the London Hackney Carriages Act, 1843. By the combined operation of the London Carriage Hackney Carriage Act, 1843 (empowering the police commissioners to set up 'standings' or cab-ranks), the London Hackney Carriage Act, 1853 (on the construction of the words 'plying for hire'), and the London



Hackney Carriage Act, 1831 (providing that a cab found standing in any street or place shall, unless actually hired, be deemed to be plying for hire, although not on any standing or place usually appropriated for the purpose of cabs plying for hire) the court in the above case decided that a London taxicab is 'plying for hire' only (1) when it is stationary and disengaged, having just set down a passenger, and (2) when it is on a rank.

**Stage Coach**, see COACH AND COACHING.

**Staggers, Sheep**, see LOUPING ILL.

**Staghound**, foxhound used only for the purpose of hunting either the wild or the 'carted' deer (see FOXHOUND). A deerhound (*q.v.*) is a quite distinct breed.

**Stagirus**, or **Stagira**, anct. tn. of Macedonia, Greece, in N.E. Chalcidice, on the Strymonic Gulf. It was the bp. of Aristotle, often therefore called the Stagiritic. The present vil. of Stavro occupies the site.

**Stahl, Friedrich Julius** (1802-61), Ger. legal writer, b. at Munich of Jewish parents, but became a Christian in 1819. He devoted himself to the study of law, taught at Erlangen and Wurzburg (1832-1840), and became prof. of the philosophy of law at Berlin (1840). He wrote *Die Philosophie des Rechts* (1830-37) and *Der Christliche Staat* (1847), etc. See lives and studies by G. Masur, 1930, and P. Drucker, 1933.

**Stained Glass** is of anct. use. The earliest known mention is of Count Arnold's gift of a S.-G. window to the abbey of Tegernsee in Bavaria in A.D. 999. S.-G. windows of an early date consisted of a mosaic-like arrangement of pieces of brilliantly S. G., the glass being stained the whole way through. Later pictorial subjects were introduced, the roughly cut pieces of glass being set in leads and fastened to an iron tracery. Slight shading and details were painted on the glass in *grisaille*. Some of the finest S. G. belongs to the thirteenth and fourteenth centuries, and even earlier. Beautiful examples are to be found in Sainte-Chapelle, Paris; Chartres Cathedral; York Minster; King's College, Cambridge; Canterbury Cathedral; Cologne Cathedral; and in the church of the mkt. tn. of Gouda in Holland. The workshops of Engrand Leprince at Beauvais produced some of the most beautiful glass of the sixteenth century, and examples are to be found in St. Etienne, Beauvais, and in St. Vincent at Rouen. In the middle of the sixteenth century a new technique was introduced, the painting of glass in enamels. This method produced imitations of oil paintings: the simplicity of design was lost and, worse, the brilliance of the glass was diminished. In the nineteenth century there was, however, a return to the older method of making S. G. Burne-Jones and Wm. Morris designed and carried out many beautiful S.-G. windows. Their designs were always without canopies to the figures, a convention that had been much used in S.-G. design. A society of S.-G. painters has done much to improve and maintain modern standards of work. To make S. G. at the present time metallic

oxides are painted on pieces of glass, which are then fired, the colours becoming fused with the glass surface. Coke kilns were once used for fixing S. G., but open gas kilns have taken their place. The processes necessary in the production of S. G. may be enumerated as follows: (1) Making of small coloured sketch. (2) Taking templates. (3) Full-size cartoon. (4) Outlining. (5) Cutting of glass. (6) Embossing. (7) Working up. (8) Painting. (9) Silver straining. (10) Firing. (11) Leading up. (12) Cementing.

See W. R. Lethaby, *Stained Glass Work*, 1905; P. Nelson, *Ancient Painted Glass in England*, 1913; H. Read, *English Stained Glass*, 1926; and E. W. Twining, *The Art and Craft of Stained Glass*, 1928. There are valuable regional studies, e.g. C. Woodforde, *Stained Glass in Somerset, 1250-1830*, 1946, and B. Rackham, *The Ancient Glass of Canterbury Cathedral*, 1949.

**Stainer, Jacob** (1621-83), Austrian violin-maker, b. in Absam in the Tyrol. He learned the craft at Innsbruck, and also perhaps with one of the Amati family or with Vimerati. From 1641 he worked on his own account, with his brother Marcus (*b. c.* 1625), the latter becoming later an independent craftsman.

**Stainer, Leslie**, see HOWARD.

**Staines**, mkt. tn. and urb. dist. on the Thames, in S.W. Middlesex, England, 19 m. from London. It has breweries, linoleum factories, and market gardens; it adjoins London Airport. There is a market twice weekly. Runnymede where King John signed Magna Carta, is only 2 m. distant, and the tn. contains the church of St. Mary, with a tower by Inigo Jones (1631). Pop. 39,200.

**Staining**, see under PAINTING AND DECORATING. *Some Decorative Methods*.

**Stanland**, tn. in the W. Riding of Yorkshire, 3 m. S.W. of Halifax, England. It has manufs. of woollen goods, worsted, cotton, and paper. Pop. 5,000.

**Stainless Steel**, see under NICKEL. *Nickel-Chrome Steels*.

**Stair, Earl and Viscount**, see DALRYMPLE.

**Stair**, par. and vil. of Ayrshire, Scotland, from which a famous Scottish family derived its title. The Dalrymples of S. held many gov. offices during the seventeenth and eighteenth centuries. The par. includes the coal-mining vil. of Trabnoch. The well-known Water-of-Ayr stone (from which curling stones are made) has been exported very largely from S. Pop. 10,500.

**Stakes**, see RACE MEETINGS.

**Stalactites and Stalagmites** are found in limestone caves and under damp arches. They are formed by the deposition of calcium carbonate from solution. Water saturated with limestone held in solution by carbon dioxide drips from the roof. As each drop gathers it partly evaporates and loses carbon dioxide; the excess of carbonate which it can no longer retain is deposited round its edges. With successive drops the deposit grows until a long pendent mass is formed possessing an internal radiating fibrous structure (stalactite). The water from which these lime icicles are derived falls to the floor, and on further evaporation these drops

give rise to pillar-like masses called stalagmites. Curtain-like structures are sometimes formed. White and blue tints may be given by salts dissolved in the water. See CAVER.

**Stalbridge** (the anct. **Staplebridge**), tn. of Dorsetshire, England, 7 m. from Sherborne. There is a very old church and a market cross. Timber and gloves are produced. Pop. 1500.

**Stalin, Iosif Vissarionovich Dzhugashvili** (b. 1879), Russian statesman, b. at Gori in Transcaucasia, son of a peasant who became a cobbler, and who died when S.



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IOSIF STALIN

was eleven years old. At seven he survived an attack of smallpox, though scars remained. From fourteen to nineteen he was at the Gk. Orthodox Theological Seminary at Tiflis, where he first took to the study of revolutionary doctrines, in 1898 joining the Social Democratic party. In the same year he was expelled. For the next few years he did propaganda work in the industrial tns. of the Caucasus. Between 1902 and 1913 he was arrested seven times, exiled to Siberia six times, and escaped five times. Up to 1917 he was an active but minor figure in the Social Democrat movement. He joined the Bolshevik faction when the party split in 1903, and first met Lenin at the all-Russian Bolshevik conference in Finland in 1905. S. attended the Russian Social Democrat conferences of the next two years, in Stockholm and London; these, apart from two short visits to Cracow and Vienna in 1912, seem to have been his only experience of foreign countries.

In Feb. 1917 the news of the revolution brought him to Petrograd, shortly to become a member of the Bolshevik party's central committee. Helping in the overthrow of the Kerensky gov., S. was one of 'the Five' of the Oct. Revolution and later of 'the Seven,' along with others of the original Bolsheviks, such as Zinoviev and Trotsky, whom he later crushed. He became commissar for nationalities, holding the post until 1923, and also took an active part in the civil war, with Voroshilov, defending Tsaritsyn (now Stalingrad) against the Whites. In March 1919 he became commissar for state control.

The opportunity to create a position of personal power came with his election to the general secretaryship of the central committee of the Communist party in 1922, for he was able to place nominees of his own in many key positions in the party. Moreover, as general secretary he was able to control the Central Control Commission in charge of the 'purges.' On the death of Lenin many others in the party had equal or better claims to leadership, and indeed Trotsky was perhaps the one generally regarded as Lenin's natural successor. Against him S. joined with Zinoviev and Kamenev, and when the Trotsky group was ousted, S. collaborated with Rykov and Kalinin against the Zinoviev group. It was not, in fact, until the final 'purges' of 1936-37 that the last of the old Bolsheviks were destroyed, but S.'s virtual victory was early estab. Thenceforward he put into practice his own policies based always on his idea of what the master, Lenin, would have wanted. He forced, at great cost, the industrialisation or collectivisation of the farms, and ruthlessly pursued Lenin's path towards converting Russia from an exclusively agric. into an industrial and mechanised country. By 1927 S. had achieved entire control of the party.

In 1936 and 1937 S. effected a party purge, marked by the Moscow trials of Radek, Bukharin, and Marshal Tukhachevsky, and many executions of former leading Communists (see *RUSSIA, History*). The enthusiasm which greeted the five-year plan overwhelmed the 'Right Troika,' as the Rykov, Bukharin, and Trotsky faction was termed, and their downfall marked the end of serious opposition to S. within the upper hierarchy of the Bolshevik party, and one may say that from the beginning of 1930 onwards S.'s authority was supreme.

S. became the core and symbol of the Communist faith, the holder of a mystic inner something known as the Party Line, which is and has from the beginning been the expression and inspiration of Bolshevik policy and belief, and it may be said that the world has known no such combination of spiritual and temporal power in the hands of a single man since the days of the mightiest popes. As has been truly said, S.'s greatest achievement has been to mobilise and direct Bolshevik fanaticism and self-devotion in unison with Russian patriotism and contempt for death. From 1934 to 1938 Com-

munists everywhere exalted S. as the champion of anti-Nazism, and indeed S. had sought collaboration with the W. democracies against Hitler. Yet in 1939, during negotiations for an alliance with Britain and France, he concluded a non-aggression pact with Hitler, giving Germany a free hand in Poland, and, following a fortnight's war between Germany and Poland in Sept., the Red Army marched westward into Poland and jointly with Hitler partitioned it.

S. took over the premiership from his able deputy and friend, Molotov, on the eve of the Ger. invasion of Russia in 1941, thereby uniting the two offices, general secretary of the Politburo and premier. S.'s conduct of Russia's defence in the Second World War belongs to the hist. of the country, and details will be found under *Russia, History*.

S.'s publs. are *Lenin and Leninism* (1924); *Problems of Leninism* (1927-29) and *Stalin Speaks* (speeches, 1945). See lives by I. D. Levine, 1931; S. Graham, 1931; H. Barbuse (Eng. trans.), 1935; V. Holland, 1935; O. Ray, 1939; D. M. Cole, 1942; E. Yaroslavsky, 1942; J. T. Murphy, 1945; L. Trotsky (Eng. trans. and ed. by C. Malamuth), 1947; and I. Deutscher, 1949.

**Stalinabad** (formerly *Dushambe*): 1. Region of the Tadzhik S.S.R. 2. Cap. of the Tajik S.S.R., 100 m. N. of the Afghan frontier, connected by a new trunk road with Tashkent, and by rail with Termez. There are cotton manufs. Pop. 82,500.

**Stalingrad**: 1. Region of the R.S.F.S.R., on the lower Volga. There is a steppe-land to the E. of the riv., but to the W. is fruitful agric. land, producing winter wheat and a variety of other crops. Area 82,360 sq. m. Pop. 2,289,000. 2. Formerly *Tsarit'syn*, cap. of the above, 25 mi. S.W. of Saratov. It is a junction between N. and S., Europe and Asia, a riv. port, connected by rail and riv. with N. Russia, Moscow, the Urals, the Donbas, N. Caucasus, the Caspian, and Central Asia. It has been described as 'the solar plexus of the Russian grain belt.' Before its destruction by the Gers. in 1942 S. was a large modern industrial city, whose pop. had grown from 20,000 in 1920 to 416,000 in 1939. It was, too, one of the great grain-producing centres. It was the economic and industrial centre of the entire lower Volga region and it owed its importance to its central position in relation to the rich grain lands of European Russia and the coalfields of the Don basin, and its situation as an important railway junction, at the point where the Don and Volga come close to each other. When the new ship canal replaces the older canal and the Volga is deepened for vessels of larger draught, S. will again become a great industrial metropolis. Three of the five main railway lines to the lower Volga converge on S. Before 1942 its new factories and workers' settlements stretched along the Volga for sev. miles. It manufactured high-quality steel and chemicals; but the foremost industry was the mass-production of heavy caterpillar

tractors for agriculture. There were also oil refineries, and saw-mills and wood-working plants, representing the former industries which began with the construction of the first saw-mill in 1880. Large apricot orchards have been planted on the light soils close to the city. In the autumn of 1918 Stalin and Voroshilov conducted a brilliant defence of Tsarit'syn (as it then was) against a White Army which had advanced from the Don region with the aim of joining the Whites from Siberia and making a single front from the Urals to the Black Sea. The defence of S. in Aug.-Nov. 1942 is one of the greatest events in the world's military hist. A sword of honour, with blade of hardest tempered steel, was presented to S. in 1943, with inscription: 'To the steel-hearted citizens of Stalingrad, the gift of King George VI., in token of the homage of the British people.' For full details of the battle for S., see *EASTERN FRONT, OR RUSSO-GERMAN CAMPAIGNS IN SECOND WORLD WAR*.

**Stalinir**, cap. of the S. Ossetian Autonomous Region of the Georgian S.S.R., 30 m. N. of Stalinsk.

**Stalin, Mount** (formerly *Garm*), peak of the W. Pamirs, in the Tadzhik S.S.R. Height, 24,585 ft.

**Stalino**: 1. Region of the Ukrainian S.S.R., in the S.E., bordering on the sea of Azov. It is an agric., lumbering, and industrial area. Area 1000 sq. m. Pop. 2,978,000. 2. Formerly *Yuzovka*, cap. of the above, some 70 m. N. of the sea of Azov, connected by rail with Mariupol. It was formerly called *Hughesovka* (*Yuzovka*), after John Hughes, iron founder and son of a Welsh blacksmith who went out on the invitation of the Russian Gov. to set up iron-works (see *HUGHES, JOHN*). On the Donetz coal-field, it is an important iron and steel centre. Pop. 462,000. 3. Seaport in the Archangel Region of the R.S.F.S.R., on the Dvinskaya Gulf.

**Stalinogorsk**, formerly *Bobriki*, tn. in the Tula Region of the R.S.F.S.R., 20 m. S.E. of Tula. It has the largest chemical works of the Soviet Union, producing nitrogenous and phosphatic fertilisers. Local deposits of phosphates and brown coal are used. Pop. 76,200.

**Stalinsk**: 1. Formerly *Kuznetsk* (q.v.) tn. of the Kemerovo Region of the R.S.F.S.R., on the r. b. of the Tom. R. It lies among meadows and marshes in the broad valley formed by the junction of the Tom and Koudoma Rs. It is the chief centre of the Siberian steel industry, and its own industry has been built up on ore from the mines in the Magnitogorsk dist. in the Urals. The ann. output of steel from its mills is over 1,000,000 tons. Iron deposits, mainly magnetite, have been discovered in the hilly, wooded countr. S.E. of S., where there is now a large mining settlement. Precious stones, gold and other minerals are also found. Pop. 169,500. 2. Tn. of the Georgian S.S.R. on the Kur R., 75 m. E.N.E. of Tbilisi, with which it is linked by rail. 3. Tn. of the Evreiska Autonomous Region of the R.S.F.S.R., on the l. b. of the Amur R.,

bordering on Manchuria, 175 m. S.W. of Khabarovsk.

• **Stall**, in eccles. architecture an elevated seat in the choir or chancel of a cathedral or other church. It is wholly or partially enclosed at the back and sides, high, and has projecting arms separating it from its neighbour, and there is usually a ledge for books. S. are generally of wood, though sometimes of stone, embellished with sculptured foliage and grotesques; while in some cases the S. is covered with a canopy of tabernacle work. Most of the S. in Eng. churches and chapter-houses are of pre-Reformation times and were intended for the use of the clergy, chapter, and monks. In cathedral and collegiate churches they are occupied by the canons and prebends. Sometimes there is a row of Ss. for the choir, because they fulfil part of the duties of the monks, the chanting of the divine office.

**Stalybridge**, municipal bor. and mrkt. tn. of Cheshire, England, on the Tame, 7 m. N.N.E. of Stockport. In 1776 a cotton mill was estab. here. The tn. is mainly engaged in engineering, iron and brass founding, colour making, and the manuf. of cotton, paper, rubber goods, and electric cables. From 1867 to 1918 it returned one member to Parliament, but now forms part of the S. and Hyde parl. div. Pop. (estimated) 22,200.

**Stamboul**, or **Stambul**, see **CONSTANTINOPLE**.

**Stamens**, in botany, form with the carpels the essential floral organs, as they are the producers of seed; the sum of the S. in each flower constitutes the andrœcium. A typical specimen consists of three parts, the filament, anther, and connective, and it is in the anther that the pollen-grains which fertilise the ovules of the carpels are developed; as a result of fertilisation the ovules develop into seeds. See **FLOWER**.

**Stamford**: 1. municipal bor. and mrkt. tn. on the R. Welland, partly in Lincolnshire and partly in Northamptonshire, England. It became a royal bor. in 972. Part of the earthworks of a Norman castle may still be seen, and during the Middle Ages a number of monasteries were founded, and seventeen par. churches built. Of the latter six survive, and St. Martin's, St. Mary's, All Saints, and St. John's are highly interesting. The Benedictine priory of St. Leonard retains a Norman arcade and a fine W. front. Among the many noteworthy buildings, Browne's Hospital of the time of Edward IV. possesses a chapel with a good screen and some exquisite glass. Burghley House, S. of the tn. was begun in 1575 by Lord Burghley. The house and grounds are open to the public at certain times. Agriculture, engineering, and timber and stone trades are important. The *Stamford Mercury* is one of the oldest newspapers in the country, and is said to have been estab. in 1695. Pop. (estimated) 10,500. 2. City of Fairfield co., Connecticut, U.S.A., on Long Is. Sound, about 35 m. from New York. It is the commercial centre of an extensive region and an important manufacturing tn., producing

builders' hardware, locks and keys, typewriters, and pianos. Pop. 48,000.

**Stamford Bridge**, vil. in the E. Riding of Yorkshire, England, on the R. Derwent, 8 m. N.E. of York. It was the scene of the defeat of invading Norwegians under Harold Haarfager by the Saxons under Harold, Sept. 25, 1066. Pop. 630.

**Stammering and Stuttering**, fairly common form of speech disorder, which is due to the inco-ordinated action of the muscles around the larynx. In stammering there is a hesitation or delay in the pronunciation of a syllable, while in a stutter there is a machine-gun like repetition of the initial letters of a syllable. Stammering may be divided into two types depending on whether it originates in childhood or makes its first appearance later in adolescence or adult life. The former is generally regarded as being mainly physiological in origin, i.e. it is believed to be the result of physiological instability in the organisation of the neuromuscular apparatus concerned in speech. It may, however, be provoked or aggravated by emotional factors, and it may arise as an imitation of other children's speech. There may be a family hist. of stammering or of some other form of speech defect. The relatively frequent association of stammering with a family hist. of left-handedness has given rise to the theory that the condition is basically due to the incomplete dominance of the leading hemisphere. This would appear to be confirmed by electroencephalograph records showing the alpha waves of the two hemispheres to be out of phase. Treatment of the physiological type of stammer usually takes the form of training in breath-control and patient re-education in articulation, coupled with the removal of any aggravating emotional factors and suggestion aimed at increasing self-confidence. Some childhood stammers, however, especially those appearing in the first few years of speech development, may be mainly psychogenic. It has been shown in some cases that stammering may be due to infantile conflicts even as early as the suckling phase. Any threat to the oral region, at the stage when phantasies are apt to centre around it, may lead to the production of a stammer as a psychoneurotic symptom. Stammering of recent origin in the adolescent or the adult is entirely psychogenic. It is, in fact, an hysterical symptom, and is usually of short duration. For its removal treatment of the underlying anxiety state by psychotherapy is called for. See also **PSYCHONEUROSIS**, *Anxiety States*; **HYSTERIA**. See S. T. Orton, *Reading, Writing, and Speech Problems of Children*, 1937; L. Despert in *American Journal of Psychiatry*, 1943; and D. K. Henderson and R. D. Gillespie, *A Text-book of Psychiatry* (6th ed.), 1944.

**Stamp**, Josiah Charles Stamp, first Baron, of Shortlands (1880-1941). Eng. economist; b. in London. He entered the civil service in 1896, and in his spare time read for an economics degree. In 1916 he became assistant secretary to the Board of Inland Revenue, but three years later

became a director of Nobel's Industries Ltd. Later S. became chairman of the L.M.S. Railway, and, in 1928, a director of the Bank of England. In addition he held sev. univ. posts, and served on various financial committees. He became a peer in 1938. A month after war broke out in 1939 the gov. appointed S. as 'adviser on economic co-ordination,' to assist the Cabinet committee on economic and financial policy; but co-ordination was not the Chamberlain Gov.'s strong suit, and S. and his fellow economists found that they had little scope. But he continued his association with the economic machinery of the war Cabinet until a few months before his death. Of his books the most scholarly was his *British Incomes and Property* (1916), a critical sifting of the statistics which provided a sounder basis than had previously existed for estimates of the national dividend and its distribution. In *The Fundamental Principles of Taxation* (1920) his wide experience as a revenue official was brought to bear on the problems of public finance. His *Wealth and Taxable Capacity* (1922) was a popular exposition of the statistical methods involved in the estimation of the nation's wealth; and *The National Income* (1927), produced in collaboration with Prof. A. L. Bowley, was the most authoritative calculation of the magnitude of that wealth that had theretofore been made. Of still greater value to economists is the series of papers he contributed to the *Economic Journal* and the *Journal of the Royal Statistical Society* of which his *Wealth and Incomes of the Great Powers* (1914), reprinted in *Current Problems in Finance and Government* (1924), is of outstanding importance. In 1929 he pub. *Taxation during the War*, a first-hand account of the taxation methods of 1914-19. Other pub. include *Report on Effect of Reparation Payments on Industry* (1925) and *Financial Aftermath of the War* (1930).

**Stamp Act.** Act passed in 1765 through the instrumentality of Grenville, and in spite of the protests of six out of the thirteen New England colonies of America, by which the gov. gave itself the right to levy a tax on all manner of documents, such as legacies, cheques, and receipts, as a means of raising revenue. The colonists, already irritated by Grenville's customs duties of 1764, declined to use the stamped paper, and on the principle of no taxation without representation, denied the right of the home gov. to tax them at all. The Rockingham Whigs, represented by Burke and Chatham, who succeeded Grenville in office, repealed the Act (1766), but with a saving clause in the shape of an Act declaring that England had full legislative and fiscal authority over the colonies.

**Stamp Collecting.** see PHILATELY

**Stamp Duties.** The law relating to S. D. is to be found in the Stamp Act, 1891, and in various subsequent Finance and Revenue Acts. The effect of the provisions of these Acts is that an unstamped or insufficiently stamped document cannot be used in evidence, except in criminal proceedings. If, however, the document

be one which may be stamped after execution, the Court will allow the party producing it to pay the S. D. and a penalty of £10. Bills of exchange and promissory notes and marine policies executed in the United Kingdom cannot be stamped after they have been issued (except that on payment of £100 penalty an unstamped marine policy may be given in evidence), and, therefore, in such cases the objection to their admissibility is fatal. The judge must take notice of the necessity for or the insufficiency of a stamp. A document should, generally speaking, be stamped previously to or at the time of its execution, unless the first execution took place out of the United Kingdom, in which case, with the exception of a marine policy, it may be stamped within thirty days of its arrival within the United Kingdom. Where more than one document is written on the same paper, each document must be stamped separately, to the extent of its proper duty by impressed stamps. Agreements under hand and receipts may be stamped with an adhesive stamp. The party first signing a document stamped with an adhesive stamp is usually the proper person to cancel the stamp by writing his name or initials and the date across the face of the stamp. Agreements under hand only and liable to a S. D. of 6d. may be presented for stamping any time within fourteen days of first execution; deeds within thirty days of first execution; marine policies executed outside the United Kingdom, but enforceable within the United Kingdom, within ten days after first reception within the United Kingdom. Foreign bills of exchange must be stamped with a specially appropriated adhesive stamp by the first recipient in the United Kingdom before he presents the instrument for payment or in any way negotiates it. The instruments for which the use of postage adhesive stamps is permitted under the Stamp Act, 1891, are agreements liable to the duty of 6d.; bills of exchange (including cheques) for payment on demand; lease or tack of a dwelling-house for a definite term not exceeding a year at a rent not over £10 a year; policies of insurance (not life or marine); and receipts. Adhesive stamps may also be used for a lease or agreement, for a lease for any definite term less than a year of a furnished dwelling-house or apartments. Where the duty payable is 1s. or 2s. postage-stamps may be used, but for duties between 3s. and 10s. special Inland Revenue stamps are provided. In two cases (Contract Notes and Foreign Bills) adhesive stamps must be used, and specially appropriated stamps are provided.

**Stamps, Postage.** see POSTAGE STAMPS; PHILATELY.

**Stand.** see WHITEFIELD

**Standard.** see BIMETALLISM; CURRENCY; FLAG, WEIGHTS AND MEASURES.

**'Standard.'** former leading London daily paper, estab. in 1827 as an evening paper. Originating during the controversy over Rom. Catholic Emancipation as a staunch upholder of the throne, the Brit. Constitution, and especially of the Protestant

religion, it was consistently Conservative throughout its existence.

**Standard**, or *Verillium*, uppermost and largest of the five petals composing the irregular corolla of papilionaceous flowers. It overlies the lateral wings and the 'keel.' In horticulture a S. tree or shrub is one grown on a single upright stem.

**Standard Hill**, in the N. Riding of Yorkshire, near Northallerton, was the scene of the battle of the Standard, fought in 1138 between David of Scotland and the N. barons, which resulted in David's defeat. The Eng. fought under the banners of sev. saints, fastened on a pole, with a cross above; hence the name of the battle.

**Standardisation.** Attempts at standardising tokens of value, weights and measures are to be observed early in the hist. of civilisation. The head of Caesar on a Rom. coin served to establish a fixed value even though in practice traders may have hoarded the heavier coins and passed on the lighter. The Romans also had standardised measures of weight. The lb. (libra) was adopted by the Romans, and was based on the weight of 7680 grains of wheat—the grain of wheat being the first unit of weight adopted; it was specified that the grains used had to be taken from the middle of the ear and dried. In Saxon times Eng. standards were kept at Winchester whence they were moved to Westminster under the Normans. In the thirteenth century it was enacted that three barley-corns = 1 in., 12 in. = 1 ft., 3 ft. = 1 ell. Most of such standards came about through a more or less unconscious evolutionary process based on common use and have survived through the centuries. With the introduction of the craft guilds in the Middle Ages, standards of workmanship and the development of technique were a function of the guilds, and the marking system (or gild marks) then adopted brought great credit to Brit. workmanship and commerce; in some cases these gild marks have continued to the present day. To meet modern needs, standards of measurement have been set up in other fields—units of temp., electric measures, frequencies, atomic weights, etc.

The remarkable expansion of production during the latter half of the nineteenth century, in Great Britain in particular, allied with increasing ease of communication bringing the products of many manufacturers to the consumers, drew attention to the need of simplification and S. in order to reduce an unnecessary multiplicity of sizes and ranges, to permit assessment of fitness for purposes, to provide a uniform basis of comparison, to define in uniform terms the correct applications and to secure accuracy of descriptions. Sir Joseph Whitworth, the inventor of the screw thread bearing his name and of precision machine tools, was the first to advocate S. to secure interchangeability, and Great Britain was the first country to put S. on an organised basis when, in 1901, the Institutions of Electrical, Mechanical, and Civil Engineers, the Iron and Steel

Institute and the Institution of Naval Architects set up a joint committee from which has developed the present Brit. Standards Institution. The institution is now recognized by gov. and by industry as the national organisation for the preparation and promulgation of all standards of national application other than for a few specialised products. Other countries have followed this lead and the Brit. Standards Institution collaborates closely with the national standards bodies of thirty-six other countries, including the Amer. Standards Association which is its counterpart in U.S.A. although the National Bureau of Standards as the gov. organisation and the Amer. Society for Testing Materials and sev. other bodies also issue national standards. The advantages claimed for standards are many, chiefly economy, reduction in selling costs, greater facilities for mass production, and greater consumer choice.

**Standard of Living.** This is the term used to indicate the results of inquiries or measurements concerning the kinds of and expenditure on food, housing, clothing, and other necessities or amenities enjoyed by any section of a community at any given moment. The results of such inquiries may be measured against certain 'desirable' or 'minimum' standards in order to assess the adequacy of an existing S. of L., or the results of successive inquiries may be compared in order to assess the changes in the S. of L. over a period of time. The results may also be used for the purpose of comparing the S. of L. of different countries. Owing to the economic upheavals which resulted from two world wars in the last half-century, and the rapid and, in some cases, violent changes which took place in the supplies and prices of commodities, the S. of L. is a much more controversial matter now than formerly. In the United Kingdom during this period, two inquiries have been made into the pattern of household expenditure in a large number of industrial and other workers' families. In 1904 the Board of Trade collected nearly 2000 urb. working-class family budgets giving particulars of family incomes and of expenditure on food and rent. The particulars derived from this inquiry, supplemented by other information, and adjusted to the price levels of July 1914, were used as a basis for the official 'Cost of Living Index' which was started early in the First World War. For some years before the Second World War, however, it was generally recognised that this index needed revision, in view of the fact that after 1914 the working-class S. of L. had obviously undergone very considerable changes. Accordingly, a second inquiry into household budgets was made in 1937-38; this inquiry covered about 10,000 working-class households. The results were summarised in the *Ministry of Labour Gazette* for Dec. 1940 and Jan. and Feb. 1941. By that time the war had broken out and the revision of the basis of the index had to be left in abeyance for a time. In 1947, however, the gov. decided that the basis of the old

cost of living index had become so out of date that the index should be terminated and that a new 'Interim Index of Retail Prices' should be substituted until it might be possible to make a further collection of household budgets and arrive at a fresh starting-point for a permanent index. The 'Interim Index of Retail Prices' measures the changes, since June 1947, in the retail prices of the goods and services which entered into working-class expenditure in 1937-38, as shown by the family budgets collected during that period.

Some idea of the changes which occurred in the S. of L. in the United Kingdom between 1914 and 1937-38 is given by a comparison of the results of the 1937-38 family budget inquiry with the expenditure basis used for the 1914-47 cost of living index. For example, in 1914 it was estimated that food accounted for about 60 per cent of the expenditure on all the items covered by the 1914-47 index, but in 1937-38 food expenditure of urb. households accounted for only about 40 per cent of total family expenditure, although the actual expenditure on food was very much higher in 1937-38 than in 1914. This higher expenditure was due not only to higher prices in the later period but also to the fact that expenditure of the present generation covers many articles of food which were not available or were seldom purchased by working-class households in 1914. The smaller proportion of total expenditure devoted to food in 1937-38 was accompanied by a much greater proportion of expenditure devoted to items outside the group of basic necessities. To this extent it can be argued that comparison of the 1937-38 standard with that of 1914 shows substantial changes in the ways of living and habits of expenditure of the classes of the pop. covered by the inquiries. When a further collection of budgets is found desirable and practicable, the results may again throw some light on further changes in the S. of L. In the meantime, though the number of workers whose wage-rates are subject to variation on a sliding scale based on the official index has fallen in recent years, the Interim Index of Retail Prices is still a factor in many negotiations between organised employers and workers about wages. In Jan. 1950 the index of retail prices stood at 113 (June 17, 1947 = 100), while the index of rates of wages in the prin. industries and services in the United Kingdom was 110 (June 10, 1947 = 100).

See also **COST OF LIVING**. For fuller information about the new Index of Retail Prices see *Interim Report of the Cost of Living Advisory Committee* (Cmd. 7077), and *Interim Index of Retail Prices—Method of Construction and Calculation*, pub. by H.M. Stationery Office.

**Standard Oil Company**, international oil combine, possessing a virtual monopoly, developed out of a company founded in Ohio in 1870. After a long-drawn-out political and legal struggle the combine was declared illegal by the U.S. Supreme Court under the Sherman anti-trust law in 1911, and was separated into its con-

stituent parts, the largest being the S. O. C. of New Jersey. See also **ROCKEFELLER**.

**Standard, Royal**, popular name of the king's banner of arms. It bears the full blazonry of his majesty's royal arms. In Richard I.'s time the royal banner bore only the three lions passant. In 1340 these arms were quartered with those of France on account of Edward III.'s claim to the Fr. crown. These were afterwards removed and those of Ireland were introduced in 1603. The lion rampant within a tressure represents Scotland. From the time of George I. until the accession of Victoria, the R. S. also bore the arms of Hanover. Since that time it has remained in its present form.

**Standards Institution**, British, see under **STANDARDISATION**.

**Standards, National Bureau of (U.S.A.)**, see under **STANDARDISATION**.

**Standard Solutions**, solutions the concentration of which is known. *Normal*, *semi-normal*, *deci-normal*, etc., solutions are a common variety of S. S., such that 1 litre of the solution contains 1 gram-equivalent, half a gram-equivalent, one-tenth of a gram-equivalent, etc., respectively, of the dissolved substance.

**Standard (or Normal) Temperature and Pressure** are 0° C. and 760 mm. respectively.

**Standards Department** (Board of Trade), gov. dept., is not to be confused with the Brit. Standards Institution. It was created by the Standards of Weights, Measures, and Coinage Act of 1866 and came into existence in 1867, taking over the functions of regulating weights and measures previously exercised by the exchequer. It is responsible for the central administration of the Weights and Measures Acts and Regulations, the day to day enforcement being in the hands of Inspectors of Weights and Measures who are appointed by the Local Authorities. Its duties include the custody of the Imperial Standards of length and mass, of the Board of Trade Standards derived therefrom and of the Standard coin weights and Trial Plates of the Realm; the periodical re-verification of the Local Standards and weighing equipment provided by the local authorities; the certification of new patterns of weighing and measuring appliances for use in trade; the examination of candidates for certificates of qualification as Inspectors of Weights and Measures; the promulgation of regulations relating to weighing and measuring apparatus in use for trade and to the sale of food; the verification of flash point apparatus under the Petroleum Acts and the general direction of the work of the Inspectors of Weights and Measures.

**Standard Time**, see under **TIME AND TIME MEASUREMENT**.

**Standerton**, tn. of the E. Transvaal, S. Africa, on the banks of the Vaal R. Great numbers of sheep, horses, and cattle are bred, and large quantities of oats, mealies, and manna raised in the dist. Pop. 10,800.

**Standing Stones**, term used of stones erected by man. They may be found singly or in groups, and some are the

remaining stones of burial chambers once set in long barrows. Other stones have inscriptions in poor Lat. or in Ogham characters. Notable S. S. are the Devil's Arrows, Boroughbridge, E. Riding of Yorkshire; the Five Kinks, in Upper Coquetdale, Northumberland; and Harold's Stones, Trolleck, Monmouth. *See also* CIRCLES OF STONES; MENHIRS.

**Standish, Myles** (c. 1584-1656). Eng. colonist, *b.* at Duxbury, in Lancashire. He served under the Veres in the Netherlands before 1603, and took an active part in the war against the Spaniards, but in 1609 settled at Leyden, from which place he embarked in 1620 for New Plymouth on the *Mayflower*. He was chosen military captain of the colony, 1621, and defended it against the attacks of the Indians, notably at Weymouth, 1622, when he defeated the Indians and broke up their hostile league. His exploits are celebrated by Longfellow in the *Courtship of Miles Standish*, and by Lowell in an *Intericue with Miles Standish*. *See* lives by J. Abbott, 1898, and T. Jenks, 1905.

**Stanhive**, *see* STONEHAVEN.

**Stanford, Sir Charles Villiers** (1852-1924), Irish composer, *b.* in Dublin, educated at Cambridge, and studied music at Leipzig and Berlin. Organist of Trinity College, Cambridge, and conductor of Cambridge Univ. Musical Society (1872-1893) and of the Leeds Festival (1901-10). He was appointed prof. of music at Cambridge Univ. 1887, and was knighted 1901. His work followed in the true Handel tradition, and he is most famous for his choral works: some religious, such as his setting of the *Stabat Mater*, and many songs and anthems; some secular, such as *Songs of the Sea* and *Songs of the Fleet*. He also wrote a number of symphonies and operas and other large-scale works such as the clarinet concerto, violin concerto, etc., and numerous works for the organ. *See* lives by J. F. Porte, 1921, and H. P. Greene, 1935.

**Stanford University**, non-sectarian co-educational univ. at Stanford, in W. California. It was founded in 1885 by an Amer. capitalist, Leland S., governor of California, in memory of his son. Its grounds cover 9000 ac. There are about 10,000 students and 800 teachers.

**Stanger**, tn. of N. Cent. 50 m. N.E. of Durban. It is the centre of an important agric. dist., producing tea, sugar, mealies, beans, and wattle. Chaka, whose memory is still venerated among the Zulus as 'The Old Lion', lies buried here, a monument being erected to him in 1932. Pop. 2500.

**Stanhope, Charles, third Earl Stanhope** (1753-1816), Eng. politician and scientist, *b.* in London. He entered Parliament in 1780 as member for Wycombe, and advocated the cessation of the Amer. war and parl. reform. He also opposed the coalition of Fox and North, and attacked Pitt's proposals for a sinking fund. He succeeded to the peerage in 1786 and became chairman of the 'Revolution Society' in 1788, openly avowing his republican sentiments. He was a remarkable public character in his time,

and his thin ungainly figure was caricatured by Gillray and other cartoonists. His *Principles of Electricity* (1779) sets out his theory on the 'return stroke' resulting from the contact with earth of lightning, which theory he worked out in fuller detail in the *Philosophical Transactions* for 1787. Among his many inventions were printing instruments and processes.

**Stanhope, Lady Hester Lucy** (1776-1839). Eng. traveller, daughter of Charles S. (third earl). She was housekeeper and trusted confidante of her uncle, Wm. Pitt (1803-6), but after his death and that of her brother and Sir John Moore, with whom she was in love, she left England and went on a pilgrimage to Jerusalem. She lived in a villa near Sidon, among the Druse tribe, from 1813 until her death. *See* her memoirs (ed. C. L. Meryon), 1845; life and correspondence (ed. duchess of Cleveland), 1913; and life by J. Haslip, 1934.

**Stanhope, James Stanhope, first Earl** (1673-1721), eldest son of the Hon. Alexander S., second son of Philip S., first earl of Chesterfield, *b.* in Paris. Educated at Eton and Trinity College, Oxford, he served first under the duke of Savoy, and then under King William III., in Flanders, in the war against France. He was returned to Parliament for the bor. of Cokeremouth in 1702, and he continued to be a member of the House of Commons from this time till his elevation to the peerage. He distinguished himself in the campaign in Spain, and in 1707 was made major-general, and in 1708 appointed commander-in-chief of the Brit. forces in Spain. He captured Port Mahon, but was defeated and captured by the Fr. in 1710 at Brihuega. In 1714 he was appointed one of the two prin. secretaries of state. In July 1717 S. was created Baron S. of Elvaston, and Viscount S. of Mahon in the is. of Minorca, and a few weeks later Earl S.

**Stanhope, Philip Dormer**, *see* CHESTERFIELD, EARL OF.

**Stanhope, Philip Henry Stanhope, fifth Earl** (1805-75). Eng. historian, styled Viscount Mahon from 1816 until his succession to the earldom. He took a degree at Christ Church, Oxford, entered Parliament in 1830, and four years later was under-secretary for foreign affairs. In 1832 he pub. his *History of the War of Succession in Spain, 1702-13*, and followed this (1836-54) with a *History of England from the Peace of Utrecht to the Peace of Versailles*. Among his other valuable works was a *Life of William Pitt* (1861-62).

**Stanhope, tn. of Durham, England**, on the R. Wear, 6 m. from Wolsingham. Lead, ironstone, and limestone are extensively worked. Pop. 1750.

**Stanhope Medal**, gold medal, instituted in 1873, which is awarded annually by the general court of the Royal Humane Society (*q.v.*), on the recommendation of its committee, for the highest example of gallantry during the year. The award originated in a memorial fund raised to commemorate the services of Capt. Chandos Scudamore Stanhope, R.N.



**Stanislas Leszczynski**, see under POLAND, History.

**Stanislas Xavier**, see LOUIS XVIII.

**Stanislav** (Polish *Stanisław*): 1. Region of the Ukrainian S.S.R. The slopes of the Carpathians in the S.W. are thickly wooded, and in the plains at the foot of the mts., watered by the tribs. of the Dniester, maize, melons, and sunflowers are grown and livestock reared. Salt, potash, and oil are found. The area was a Polish co. until taken by Russia in 1939, and ceded to Russia in 1945. Area 6520 sq. m. Pop. 1,477,000 (69 per cent Ruthenian and 25 per cent Polish). 2. Cap. of the above, 75 m. S.E. of Lvov. Machinery and textiles are produced, and there are oil-refineries and railway workshops. It lay in Poland until occupied by Russia in 1939, and was in Ger. hands from 1941 to 1944. Pop. 60,000.

**Stanko**, see KOS.

**Stanley**, see DERRY, EARLS OF.

**Stanley, Arthur Penrhyn** (1815-81), Eng. churchman and theologian, b. at Alderley, Cheshire. He was educated at Rugby, under Arnold, and at Balliol College, Oxford, and in 1839 was elected a fellow of Univ. College and took orders. In 1856 he was prof. of eccles. hist. and canon of Christ Church, and in 1863 dean of Westminster. He travelled in Palestine and Egypt (1852-53), in Russia (1857 and 1874), accompanied the Prince of Wales on an E. tour (1862), and visited America (1878). S. was well known for his broad church views. He wrote *Life of Arnold* (1844); *Sermons on the Apostolical Age* (1847); *Bishop Stanley* (1851); *Memorials of Canterbury* (1854); *Sinai and Palestine* (1856); *Lectures on the Jewish Church* (1863-76); *Memorials of Westminster Abbey* (1868); and *Essays on Church and State* (1870). See R. E. Prothero and G. G. Bradley, *Life and Correspondence*, 1893, and H. Bolitho (ed.), *A Victorian Dean*, 1930.

**Stanley, Sir Henry Morton** (1841-1904), Brit. explorer and author, b. at Denbigh. At the age of fifteen he went to New Orleans, and in 1861 entered the service of the Confederate States. The years 1863 and 1864 were spent in voyages to the W. Indies, Italy, and Spain, and in 1867, having already estab. a connection with the press, he was appointed correspondent for the *New York Herald*, and accompanied Lord Napier's Abyssinian expedition. He next visited Spain, the Suez Canal, Palestine, Turkey, Persia, and India, and then set out to find Livingstone, reaching Zanzibar in 1871. He came upon him at Ujiji, and together they explored the N. end of Lake Tanganyika. In 1872 he pub. *How I found Livingstone*, and in 1874 set off on another expedition, circumnavigated Lake Victoria Nyanza, passed down the Lualaba to its confluence with the Congo, and then traced the course of that riv. to the sea. Having pub. *Through the Dark Continent* (1878), he in 1879 again set out and founded the Congo Free State. He took part in the expedition for the relief of Emin Pasha, and after much disaster met Emin on the shores of Albert Nyanza. Among other works of his are *The Congo* (1885); *In*

*Darkest Africa, or The Rescue of Emin* (1890); and *My Early Travels in America, and Asia* (1895). His autobiography was ed. by his widow (1909). See lives by J. Wassermann (Eng. trans. 1932) and F. Hird, 1935; and Glivia Stanley, *The Remarkable Expedition*, 1947.

**Stanley, Oliver Frederick George** (b. 1896), Brit. statesman, a younger son of the seventeenth earl of Derby, educated at Eton and Oxford. After military service in the First World War he was called to the bar (1919), practising for a short time, and then became a stockbroker. He was Conservative M.P. for Westminster from 1924 to 1945; parl. under-secretary to the Home Office, 1931-33; minister of transport, 1933-34; and minister of labour, 1934-35. Here his political prospects suffered a setback on account of the regulations issued under his Unemployment Assistance Act passed to deal with the problem of 2,000,000 unemployed. He was then transferred to the presidency of the Board of Education, 1935-37. His next post was that of president of the Board of Trade, 1937-40. In 1940 Chamberlain appointed him secretary of state for war in succession to Horne-Bechsha. The first two years of the Churchill Gov. he spent in the army, but in 1942 was recalled to be secretary of state for the colonies, following a swift succession of colonial ministers. He occupied this post until Aug. 1945, and during his tenure were appointed the Colonial Medical Research Committee, the Colonial Animal Health and Forestry Research Committee, the Colonial Social Welfare Advisory Committee, and the Tsetse Fly and Trypanosomiasis Committee.

**Stanley**: 1. Urb. dist. of Durham, England, 7 m. S.W. of Newcastle. It has coal-mines and women's and children's clothing factories. Pop. 50,000. 2. Par. and vil. of Derbyshire, 5 m. N.N.E. of Derby. It has coal-mines. Pop. 1900. 3. Urb. dist. in the W. Riding of Yorkshire, 2 m. N.N.E. of Wakefield. There are coal-mines and brickfields, and rhubarb is extensively grown. Pop. 15,700. 4. Vil. of E. Perthshire, Scotland, on the W. bank of the Tay, 7 m. N. of Perth. It has a cotton factory. Pop. 1500. 5. Cap. of the Falkland Is., about 8100 m. distant from Liverpool or twenty-six days' sail. It has a memorial commemorating the victory of Adm. Sturdee over von Spee's squadron on Dec. 8, 1914. S. is the only important settlement of the colony and is situated on the coast of E. Falkland. There is a good harbour and a wireless station.

**Stanley Pool**, enlargement of the Congo R., Africa, discovered by H. M. Stanley in 1877, about 25 m. long, 15 m. broad, and about 350 m. from the riv.'s mouth.

**Stanleyville**, tn. on the Congo R., Belgian Congo, cap. of E. Prov. It is a trading centre, and is connected by rail with Pontherville. The Congo is navigable as far as the tn., from Leopoldville, from which it lies 800 m. N.E. Pop. 13,600.

**Stanmore, Arthur Hamilton Gordon**, first Baron (1829-1912), Eng. administrator. Having graduated at Cambridge

(1851), he became private secretary to the Prime Minister (1852-55), and acted as secretary to the special mission to Corfu (1858-59). He was governor of Trinidad (1866-70), Mauritius (1871-74), Fiji (1875-1880), New Zealand (1880-82), and Ceylon (1883-90). His pubs. include *Story of a Little War* (1879); *Life of Lord Aberdeen* (1893); and *Memoir of Sidney Herbert* (1906).

**Stanmore**, part of the Harrow urb. dist., Middlesex, England, and a residential area. Fighter command of the R.A.F. has had its headquarters here since the Second World War.

**Stannaries** (Lat. *stannum*, tin). Court of the S. of Cornwall and Devon is a court of record (q.v.), with a special jurisdiction for the administration of justice among the tinners of those cos. The judge of the court is called the vice-warden. The jurisdiction rests on an anct. privilege confirmed by royal charter in 1305, granted to the tin miners to sue and be sued in their own court so as to avoid being drawn from their business to the public detriment.

**Stannic Acid**, see TIN.

**Stansfield, Grace**, see FIELDS, GRACIE.

**Stanton Drew**, par. of Somerset, England, 6 m. S. of Bristol, with numerous Druidical antiquities and a Norman bridge. There are coal-mines near by, and trout-fishing in the R. Chew.

**Stanza**, word of It. origin, signifying a number of verses, connected by metre and rhyme to form a regular div. of a poem. The word is specially used in Italy to denote the *ottava rima* (q.v.), a particular form of S.

**Staphyloma**, bulging outward of part of the globe of the eye. Anterior S., a bulging forward of the cornea and sclerotic (probably caused by a perforating conical ulcer). Posterior S., protrusion backward of the sclerotic at the posterior pole caused by high myopia, usually accompanied by choroiditis.

**Staple** (O.F. *estape*, mart or marketplace for wines), once written *estaple*. Used to denote those tns. called 'S. tns.', both in England and on the Continent, where the prin. products or 'S. commodities' of a country were sold. Instances of important S. tns. were London, Calais, Antwerp, Bruges, Canterbury, Newcastle, Bristol, Norwich, Chester, Carmarthen, Cork, and York. All merchandise sold for the purpose of exportation was compelled either to be sold at the S. or afterwards brought there for exportation. Afterwards the word S. came to be applied to the merchandise itself which was sold at the S. tn. The merchants of the south of England traded chiefly with Flanders in wool, woollens, or sheepskins, leather, lead, and tin. The merchants of the south reached the pitch of their power under Edward II. They had their own court, called the 'court of the mayor of the S.', a court of considerable antiquity. Most of the enactments relative to the S. were passed during the reigns of Edward I. and II. The object of the Statute of Acton Burnell (1283) was to remove the S. previously

held at Calais to various tns. in England, Wales, and Ireland. In 1328 the S. was abolished, though reimposed very shortly afterwards. In 1353 by the *Ordinance of the Staple* (see CUSTOMS DUTIES) the S. was regulated and the privileges of the S. merchants confirmed.

**Staplebridge**, see STALBRIDGE.

**Staples**, The, see FARNE ISLES.

**Stapulensis**, Jacob, see FABER, JACQUES.

**Star**, see STARS.

'Star,' penny evening daily (London), estab. in 1888 by T. P. O'Connor. Its next editor was the equally well-known Liberal journalist, H. W. Massingham, who continued O'Connor's support of Gladstone's policy. In 1941 A. L. Cranfield became editor. The S. was long associated with the old *Morning Leader*, later the *Daily News and Leader*. The S. makes special appeal to women through its 'Star Man's Diary' and 'human' features. Sales exceed 1,200,000 daily. The S. is owned chiefly by the Cadbury family, as also is the *News Chronicle* (q.v.).

**Star, 1914-15: 1.** '1914 Star.'—This Brit. decoration is a bronze S., with no clasp, pendent from a riband red, white, and blue, shaded and watered, and was granted under an Army Order dated Nov. 24, 1917, as a distinctive decoration for services rendered by the military forces under the command of F.-M. Sir J. D. P. French in France and Belgium during the earlier phase of the First World War in 1914. All military personnel who actually served in France or Belgium on the estab. of a unit of the Brit. Expeditionary Forces between Aug. 5, 1914, and midnight of Nov. 22, 1914, were eligible for the decoration. This decoration is popularly known as the 'Mons Star.' 2. '1914-15 Star.'—This decoration was granted under an Army Order dated Dec. 28, 1918, in recognition of services rendered by the Forces in theatres of war between Aug. 5, 1914, and Dec. 31, 1915 (inclusive). The S. and riband are similar in appearance to the 1914 decoration. Qualifying service was in certain scheduled theatres of war, and between certain scheduled dates. Individuals in possession of the '1914 Star' were not eligible for the '1914-15 Star.'

The 1939 45 Star has a dark blue, red, and light blue ribbon in three equal vertical stripes. See also ATLANTIC STAR; BURMA STAR; FRANCE AND GERMANY STAR; ITALY STAR; PACIFIC STAR.

**Star Apple**, see CHRYSOHYLLUM CAINITO.

**Staraya Russa**, tn. in the Leningrad Region of the R.S.F.S.R., 36 m. S. of Novgorod, on the Valdai Hills. It is a health resort. The tn. saw fierce fighting during 1942. Pop. 21,500.

**Starazagora** (Turkish *Eski-Zagra*), tn. of Bulgaria in E. Roumelia, S. of the Balkans, cap. of a co. of the same name. It is situated in a fertile dist., which produces cereals, wine, and fruit. Trade is carried on, and there are some industries, including the production of attar of roses, and there are mineral baths. Area of co. 6002 sq. m. Pop. 812,700. Pop. of tn. 29,900.

**Starch**, or *Amylum* ( $C_6H_{10}O_5$ )<sub>n</sub>, carbohydrate, widely disseminated throughout

the vegetable world. It occurs in rice and all kinds of grain in quantities up to 75 per cent, and also occurs in tubers, such as potatoes and arrowroot. From these substances it is prepared by macerating (potatoes) or fermenting (grain) and then washing with water. The S. settles from the water as a paste, which is washed by decantation. It forms a white powder which is made up of striated granules, is insoluble in cold water, but swells and gelatinises in hot water, and is coloured blue with iodine. Boiled with dilute acids it is converted to dextrin and glucose, and heated with diastase it forms dextrin and maltose, which substances are also formed by the action of saliva and pancreatic juice on S. In green plants S. is formed from water and atmospheric carbon dioxide by the agency of the green colouring-matter chlorophyll; the necessary energy is derived from sunlight. There are probably sev. different kinds of S., which name is really a generic term like 'sugar.'

**Star Chamber**, Eng. high court of justice going back at least as far as Edward III.'s reign, when jurisdiction was exercised in the *chambre des estoiles*, Westminster, the name being derived, perhaps, from a starry decoration on the ceiling. It originated in the civil and criminal jurisdiction of the privy council and was in fact identical with the king's council acting in its judicial capacity. After the estab. of the court of chancery this jurisdiction declined but was revived on account of the lawlessness and corruption of juries which followed the Wars of the Roses. In 1487 the Statute 3 Henry VII., c. 1 constituted a committee of the council, a court with considerable judicial powers, for the purpose of suppressing the evils arising from seditious assemblies and from livery and maintenance. The members of the court were the lord chancellor, lord treasurer, keeper of the privy seal, a bishop, a lord of the council, and the two chief justices. Under Edward VI. the S. C. was still a committee of the council, but by the end of Elizabeth's reign it had become a judicial body distinct from the latter, but it had ceased to remedy the uncertainties and inadequacy of the common law and under the Stuarts it became merely an instrument for enforcing the claims of the prerogative. The procedure of the court was entirely unregulated by law, and consisted in summoning the accused to appear and then examining him on oath. The punishments, which were usually excessive, and often illegal, included mutilation, whipping, and torture to extract evidence or confessions. The abolition of the court in 1641 (16 Car. I. c. 10) deprived the crown of a formidable weapon for the suppression of free speech and writing and for the enforcement of proclamations which the king had no right to make.

**Starch**, *Animal*, see GLYCOGEN.

**Staré-Benátky**, former com. of Czechoslovakia, merged with Nové-Benátky to form the tn. of Bená and Jizerou. This tn. is in the dist. of Mladá Boleslav, and the former Ger. name Jungbunzlau applies to the chief tn. of the dist., also Mladá

Boleslav (*q.v.*), 30 m. N.E. of Prague. Pop. of Bená and Jizerou 4300.

**Starfish**, or *Asteroida*, class of the echinoderms, with a body of starlike shape, the rays of which usually number five; these are movable arms with skeletal structures, consisting of calcareous plates transversely arranged and articulated with one another like vertebrae. Into the arms the chief organs are prolonged. A series of tube feet or suckers is developed along each ray, and is supplied by a system of water vessels. The mouth and the anus are at the centre of the disk. S. live on oysters and other molluscs and dead fishes, and cause considerable loss in some fisheries. The sexes are distinct, and the free-swimming larvae, into which the eggs hatch, pass through a series of remarkable stages.

**Stargard**, see STAROGARD.

**Stark, Freya Madeline**, Eng. explorer and travel writer, educated in Italy, at Bedford College, and at the School of Oriental Studies. She worked on the *Baghdad Times* and pub. *Baghdad Sketches* in 1933 (new ed. 1937). *The Valleys of the Assassins* (1934) describes journeys in Persia and Kurdistan, for which she received the Burton Medal of the Royal Central Asian Society. She wrote *The Southern Gates of Arabia* (1936) after explorations in the Hadhrumant. During the Second World War she worked for the Ministry of Information in the Middle E. and N. America. Her other pub. are *Seen in the Hadhrumant* (1938); *A Winter in Arabia* (1940); *Letters from Syria* (1942); *East is West* (1945); and *Perseus in the Wind* (1948).

**Stark, James** (1794-1859), Eng. painter, b. at Norwich. He was a pupil of John Crome for three years, exhibited at the Royal Academy in 1811, and became a member of the Norwich Society of Artists in 1812. He moved to London in 1814, and three years later attended the Royal Academy schools. Ill health caused his return to Norwich, but he came back to London in 1830, and removed to Windsor in 1840. S. painted landscapes and riv. and coast scenery. 'The Valley of the Yare, near Thorpe, Norwich' and 'Woodv Landscape' are in the Tate Gallery, London.

**Stark Effect**. Atoms that emit light while in a powerful electric field have their spectra changed (see SPECTRUM) by the field, and each line of the ordinary spectrum is split into a number of components which may be polarised in various ways. The phenomenon was discovered in 1913 by the Ger. physicist, Johannes Stark (*b.* 1871, awarded the Nobel prize for physics, 1919), and investigated in detail by him in the following years.

**Starley, James** (1831-81), Eng. inventor, b. at Albourne, Sussex. He invented a type of sewing-machine in 1857. Afterwards he made bicycles at Coventry. His nephew, John Kemp S., introduced the safety bicycle.

**Starling, Ernest Henry** (1866-1927), Eng. physiologist, b. in Bombay, was prof. of physiology at Univ. College, London, from 1899 to 1923. He studied the

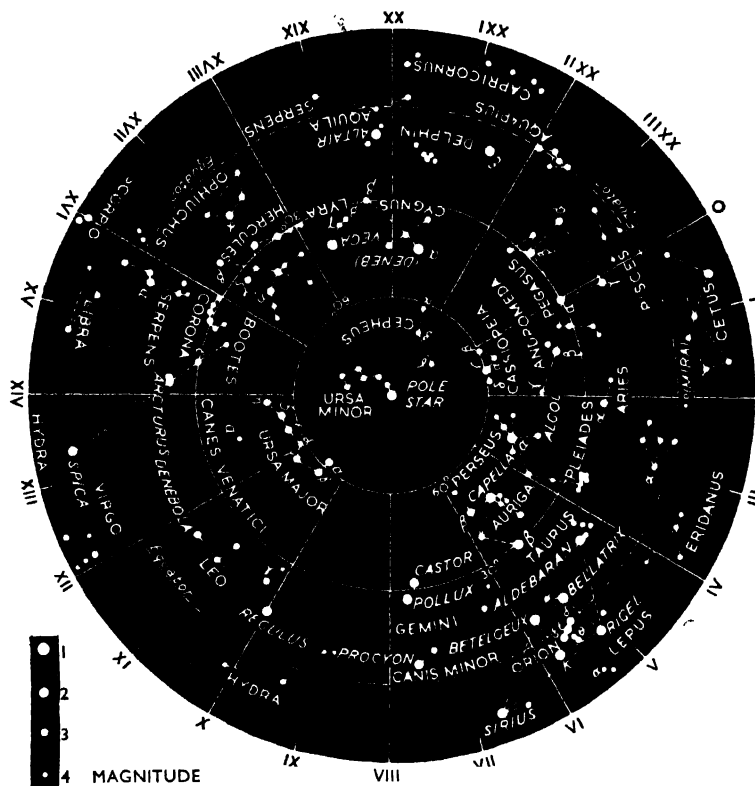
secretions of the body, and discovered the substance secretin. He wrote *Principles of Human Physiology* (5th ed., 1930).

**Starling** (*Sturnus vulgaris*), passerine bird, common in Europe, and of recent years in Britain. It is about 8½ in. long, and the head, neck, back, and under-parts are a metallic glossy black. The feathers on the upper parts are tipped with buff, and the wings are greyish-black, with a

**Starnose, see SHREW-MOLE.**

Star of Bethlehem, *see* ORNITHOGALUM  
Star of India, *see* INDIAN ORDERS OF  
KNIGHTHOOD.

**Stargrad** (Ger. Stargrad), tn. in Poland, formerly in Germany, on the Ihna, 22 m. S.E. of Szczecin (Stettin). St. Mary's Church was built in 1292 as a hall, and converted in the fifteenth century, and the Rathaus is a sixteenth-century structure.



THE NORTHERN SKY EXTENDED TO ABOUT 25° SOUTH OF THE EQUATOR  
Constellations are printed in square capitals and stars in Greek letters or in italic capitals, with the exception of the important group known as the Pleiades in the constellation of Taurus.

reddish-brown fringe. The female is less glossy and lustrous than the male. Nests are made almost anywhere, about five pale blue eggs being laid. The food consists principally of worms, snails, and insects, and the birds are, therefore, of great benefit, though they often devour orchard fruit, and are sometimes destructive to seed wheat. A number of closely related foreign birds are known as *S.* For the rose-coloured *S.* see PASTOR.

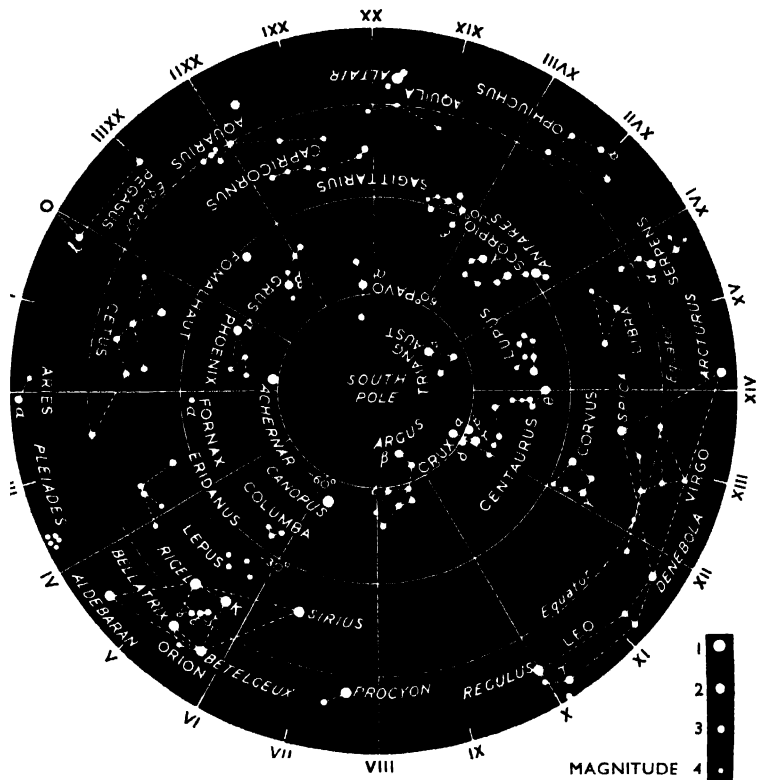
S. was part of the Hanseatic League. There are manufs. of machinery and tobacco, mills, and breweries. Pop. 40,300.

**Stars.** Until the time of Halley the S. were supposed to be fixed because they did not appear to change their positions relative to each other or to the planets in the solar system. It is now known that the apparent motions of the S. are small only because they are at enormous distances from the earth. Thus, excluding the sun

itself, the nearest star is Proxima Centauri, some 25 billion m. away, so that light, travelling at 186,000 m. per sec., takes over four years on its journey from the star to the earth. The most distant bodies at present known are over 500 million light-years: these are the extra-galactic nebulae, but the S. visible with the naked eye are in our galaxy, and none exceeds about 100,000 light-years in

tudes and the nature of the light they emit (see below), and the positions of the S. at any epoch can be deduced from the information included in the catalogue.

**Stellar Magnitudes.**—Since the time of Hipparchus (*q.v.*) the classification of S. according to their apparent brightness has engaged the attention of astronomers. Hipparchus called the brightest S. he could see S. of the first magnitude, while



THE SOUTHERN SKY EXTENDED TO ABOUT 25° NORTH OF THE EQUATOR  
The Roman numerals in both maps refer to the Right Ascension of the stars, and the equator and declination circles 30° and 60° are shown

distance. It is therefore not surprising to find that the well-known constellations maintain the same configurations with respect to the earth for thousands of years, although the S. are travelling with great velocities relative to us.

Star catalogues have been compiled by astronomers during the past 300 years, one of the most important to-day being the Henry Draper catalogue of Harvard. Such a catalogue classifies the individual S. according to their magni-

tudes just visible to the naked eye were called S. of the sixth magnitude. The determination of stellar magnitudes has since been made a scientific measurement. Following Herschel (*q.v.*) the mean apparent brightness of the sixth magnitude S. of the older classification has been adopted as the standard for the sixth magnitude of the modern classification. A star of the fifth magnitude is one whose apparent brightness is 2.5 times that of the sixth magnitude; one of the fourth 2.5 times as

bright as that of a star of the fifth magnitude, and so on. S. of the first magnitude are apparently 100 times as bright as S. of the sixth magnitude. Modern methods of measuring the apparent brightness of a star enable the astronomer to subdivide each of the different magnitudes. Thus Sirius, the brightest star, is of magnitude  $-1.4$ , i.e. 2.4 magnitudes below a star of the first magnitude. Stellar magnitudes are determined either directly by means of a telescope or by a photographic or photo-electric method. The total number of S. of magnitude visible to the naked eye is about 6000, of which number about 2000 may be seen on a clear night. The Yerkes telescope will show S. of the seventeenth magnitude. Recent estimates give 50,000,000,000 as the order of the number of S. in our galactic system, and each of the many millions of other galactic systems probably contains a number of the same order.

**Proper Motion of Stars.**—The proper motion of a star is defined as the component of its motion at right angles to the line of sight that causes an apparent displacement of the star relative to the other S. (see further PROPER MOTION). The proper motion of  $\alpha$ -Centauri, for example, is 3.68" per annum, i.e. if  $S_1$  and  $S_2$  are the respective positions of this star relative to the earth E at the beginning and end of a year, then the angle  $S_1ES_2$  is 3.68". Comparatively few S. have a proper motion greater than 1" a year; such a proper motion would cause an angular displacement of 1' to an observer on the earth in 3600 years.

The motion of a star in the line of sight can be detected and measured by means of the Doppler effect (q.v.), that causes a shift of the spectral lines towards the violet end of the spectrum if the star is approaching, towards the red end if it is receding (see also SPECTRUM; SPECTROSCOPY).

**Stellar Spectra.**—The Draper catalogue classifies the S. according to the type of spectrum obtained from them. Stellar spectra consist of a continuous spectrum crossed by absorption lines or bright lines or both. According to the type of spectrum the star is classified as a star of one of the following groups: O, B, A, F, G, K, M, R, N, S, N., the significance of which is described below under *Stellar Evolution*. The groups are further subdivided to differentiate between the S. whose spectra differ in degree but not in type. The sun's spectrum is characteristic of the type G.

**Temperature of Stars.**—The colour of the light emitted by a star is connected with its surface temp., and the estimate of this temp. is based on the distribution of the energy radiated from the star among the various wave-lengths in its spectrum (see RADIATION). The surface temp. of the sun is about 5900 C., while that of some of the hottest S. of type O is about 50,000° C.

**Distances of the Stars.**—The semi-diameter of the earth's orbit is taken as the base line for the measurement of the distances of the S. Distances are expressed in terms of the ann. parallax of

the star, i.e. the angle subtended by the semi-diameter of the earth's orbit at the star. For the nearest star, Proxima Centauri, this parallax is only 0.78". The linear distance can be determined by elementary trigonometry from the stellar parallax; it may be expressed in miles or in light-years, the distance light travels in one year, but for astronomical purposes the unit adopted is the *parsec*, a distance corresponding to a stellar parallax of 1", which is about 19.1 billion m. The standard method for determining stellar parallaxes of the nearer S. is to take photographs of the star at intervals of six months. A comparison of the shifts of the star relative to the background of the very distant S. enables the parallax to be determined. In recent years another method has been evolved for the measurement of the distances of more remote S., a method that also gives the size of the star (see below).

The reader should refer to the articles on MULTIPLE STARS, NOVAE, for further information regarding those types of S. Variable S. possess characteristics that have contributed much towards the rapid progress that has been made in astronomical science during the present century.

**Cepheid Variables.**—The star  $\delta$ -Cephei is a single star that pulsates, i.e. it expands and contracts, in a regular period of 5.37 days. The pulsations cause a corresponding periodic variation in the intensity of the light emitted by the star. The distance of  $\delta$ -Cephei has been determined, and also its intrinsic luminosity. There are scattered through the universe an enormous number of S. that are seen to be similar to  $\delta$ -Cephei; they are known as Cepheid variables. In 1912 Miss Henrietta S. Leavitt, of the Harvard Observatory, made a very important discovery about these S. She found that their periods, which vary from a few hours to about fifty days, depend on their luminosities, the more luminous the S. the longer the periods, and the less luminous the S. the shorter the periods. The luminosity of a star is not the same thing as its magnitude; a star might appear to be very bright merely because it is comparatively close to us and yet it might be much less luminous, if only it could be seen at the same distance, than many faint S. Astronomers have agreed to give the name *absolute magnitude* to the apparent magnitude of a star if it were placed at a distance of 10 parsecs or 32.6 light-years. Hence, knowing the distance of a star and also its apparent magnitude, its absolute magnitude is easily calculated, and a catalogue of absolute magnitudes of S. immediately gives an insight into their intrinsic brightness or luminosities. Suppose a Cepheid variable is observed and its distance in light-years and its apparent magnitude known, its absolute magnitude and hence its luminosity can then be calculated, and its period, ascertained by observation, enables the astronomer to establish a relation between its luminosity and period. This star can then be used as a standard for any number of Cepheid variables.

Another Cepheid is observed with the same period, and it is certain that its luminosity is the same as the previous one; but its magnitude is probably very different because it is not at the same distance and it is easy to calculate how far away it is, knowing its apparent magnitude and luminosity. This simplifies the problem because not all Cepheids have the same period of the hypothetical one taken as a standard, but this is not a serious difficulty. Actually the relationship between the periods and the luminosities is well established, and knowing the former by observation, the latter is computed. Then, when the apparent magnitude has been ascertained and compared with the luminosity, the distance is known. A good illustration is found in the case of two street lamps. If their apparent brightness is compared by a photometric method it is possible to determine the distance of the second lamp if that of the first is known. Even if one lamp differs from the other in luminosity, so long as this difference is known, the distance of the second lamp can be found. This simple method has been applied in recent years to determine the distances of the remote parts of the universe. Wherever a Cepheid variable is found, the distance of that region can be calculated.

**Stellar Evolution.**—The birth of the S. from nebulae is discussed under NEBULAR THEORY. The spectral types of the S. classified as O, B, A, F, G, K, M, R, N, S possess the following characteristics. The O and B types are characterised by hydrogen and helium lines. S. in the A to F classes are white or blue S. whose spectra are chiefly characterised by strong hydrogen absorption lines. F, G, and K types contain the absorption lines due to the metallic elements (e.g. the solar spectrum of type G). The remaining types are orange and red S., and their spectra are crossed by absorption bands due to hydrocarbons. Betelgeuse, in the constellation Orion, is a red star of type M. The present theory of stellar evolution suggests that a star begins as a red giant of type M. As an example Betelgeuse may be quoted. Its diameter is of the order of 300,000,000 m., i.e. if it occupied the position of our sun, the earth's orbit would lie within the star. It is so diffuse that its density is about  $\frac{1}{1000}$  of the density of air, while its surface temp. is about 3000° C. The red giant contracts, its density and its temp. increasing, so that it passes through succeeding spectral types M, K, G, F, A, B. The 'degeneration' then begins, and the star is now termed a dwarf. Its surface temp. decreases while its size decreases and its density continues to increase. Our sun is a red dwarf of type G. There are a few white dwarfs whose density is so great that, as Eddington says, a ton of the star would occupy the volume of a match-box. The companion of Sirius is a notable example of this class of white dwarf. It should be pointed out that theories of stellar evolution are highly speculative and there is still much uncertainty on the subject.

**The Interior of the Stars.**—From the point of view of the scientist the conditions inside a star are physically simple, i.e. it consists of atoms, electrons, and ether waves, and the laws of a perfect gas hold for these conditions. Knowing the mass of the star, and its magnitude, it is possible to compute by the method of trial and error what the temp. at any point inside a star must be in order that equilibrium may be obtained between the gravitational attraction of the inner layers on those above, and the bombardment of the outer layers by the atoms and electrons below. In this way it has been found that the temp. at the centre of the sun must be 20,000,000° C. in order that this equilibrium may be maintained. Further considerations lead to the conclusion that the age of the sun is probably 3,000,000,000 years or more.

**Stellar Distribution.**—It is obvious to a casual observer that the S. are not uniformly distributed throughout the heavens. On a clear night the belt of S. that is known as the Milky Way or Galaxy may be seen quite distinctly with the naked eye. This belt encircles the heavens. Shapley, who has done brilliant work in this phase of astronomy since 1920, explains that the phenomenon of the Milky Way is largely an optical one. The apparent belt is really a depth effect. S., groups of S., and star clusters being concentrated in the plane of the Milky Way. The sun is far removed from the centre of the stellar system, that must now be regarded as a thin, disk-like system extending far in the direction of the galactic plane.

**Star Clusters.**—(1) Globular clusters consist of an enormous number of S. grouped together to form a spherical cluster. At the centre of the sphere the S. are packed together relatively closely; the density of packing decreases fairly rapidly at first from the centre outwards, but the decrease becomes more gradual towards the boundary, which is not sharply defined. There are about 100 such clusters known at present, one of the most famous being the Hercules cluster. Globular clusters are fairly symmetrically distributed with respect to the plane of the Milky Way, about 7° or 8° from that plane. The brightest S. in such clusters have been shown to be giants. Since globular clusters generally contain Cepheid variables, the distances of the clusters have been computed. The nearest galactic clusters are more than 20,000 light-years away, while some are nearly 200,000 light-years distant. The diameters of these clusters are of the order of sev. hundred light-years. The clusters are approaching the galactic system, and Shapley states that a close approach leads to the break-up of a globular cluster under the gravitational attraction of the galactic system. It is suggested that this break-up creates the open clusters and the moving star-groups found in the Milky Way. (2) Open clusters contain far fewer stars than their suspected parents, the globular clusters. Their shape too is less regular than that of the globular

cluster. They are found in the regions close to the galactic plane. The best known are the Pleiades and the Hyades in Taurus, Praesepe in Cancer, the double cluster in Perseus, and the cluster in Coma Berenices, all visible to the naked eye.

See T. E. R. Phillips and W. H. Stevenson (ed.), *Splendour of the Heavens*, 1923; H. S. Jones, *General Astronomy*, 1923, 1934; H. Macpherson, *Modern Astronomy*, 1926; A. S. Eddington, *Stars and Atoms*, 1927; Sir J. Jeans, *The Universe around Us*, 1929, *The Mysterious Universe*, 1930, and *Stars and their Courses*, 1931; M. Davidson, *From Atoms to Stars* (2nd ed.), 1946; and P. Doig, *An Outline of Stellar Astronomy*, 1947.

**Stars and Stripes**, see under FLAG.

**Starshine Camera or Night-sky Recorder** is exposed at night pointing towards the pole, about which the stars describe circles once every twenty-four hours. The stars are observed when cloud passes over so that the length of trace gives a rough measure of the amount of clear sky during the night just as does the sunshine recorder (q.v.) during the day. The traces of sev. stars appear on the negative but only those of  $\alpha$ -Ursae Minoris (the pole star) and  $\delta$ -Ursae Minoris are measured because they are the only ones not obliterated by bright moonlight. See N. K. Johnson, A. J. Lander, and W. A. Toms, 'Night-sky Recorder,' *Meteorological Magazine* (vol. lxxvii.), 1948.

**'Star-spangled Banner'**, see under NATIONAL ANTHEMS.

**Star Stone**, see SAPPHIRE.

**Star-stone**, see ASTERIA.

**Starstow**, see DITTERSBACH.

**Star Tulip**, see CALOCHORTUS.

**Starvation**, see FASTING; F. NGEN.

**Starwort**, or **Stitchwort**, see STELLARIA.

**Stassfurt**, tn. of Saxony-Anhalt, Germany, on the Rode, 19½ m. S.S.W. of Magdeburg. There are rich deposits of kaolinite and rock salt mines. The tn. has chemical works, and produces lin and asbestos products. Pop. 15,800 (with Leopoldshall 23,200).

**State.** Theories of the nature of the S. divide broadly into three types. Of these the individualist theory, widely held in the seventeenth to the nineteenth centuries, regarded the S. fundamentally as an enemy of liberty, even in those areas where its necessity was conceded, and, significantly, was inclined to equate the S. with its gov., rather than to recognise the latter merely as an agency of the former. In total opposition stands the organic or idealist school, which, represented in Plato, received a new support from Hegel. Supporters of this doctrine have claimed Rousseau as one of themselves. In this view the S. is the complete, final and all-embracing form of human society, and only in the S. can the individual find his fullest expression. His will is to be merged in that of the S., and his greatest freedom lies in its service. This theory rests upon a fatal confusion of S. and society, and leads inevitably to the totalitarian scheme.

The group theories would appear to

answer more correctly to the facts of society. To fulfil their economic, spiritual, and cultural needs individuals join themselves voluntarily into groups of many different kinds, which derive their existence from the persons who compose them. The sense of the common aim overrides the differences within the group, but it does not abolish them, and the basic unity is the consensus about values cherished in common. Society, therefore, besides containing the 'countless unformulated relations of man to man', comprises the complex of groups. The function of the S. is to represent the general public good of the people taken as a whole. For this purpose it is given a coercive power, its distinguishing mark. In a conflict between itself and any group the S. will win only provided it commands the greater loyalty and is backed by the ultimate sovereign, general public opinion. The S. has achieved since about the time of the Reformation its normal modern supremacy because it alone has given the best prospects of social order, peace, and satisfaction of general needs. The 'machine' theories, that the S. is simply and solely a mechanism set up by man in society to further his needs, result practically in a similar view of the purpose of S.

The problem of its organisation is that of the relationship between the subjects and the law; to the extent that they share in its making, the S. is a democracy, and to the extent that law is imposed upon them, the S. is an autocracy. A mixed form generally occurs in practice, and the precise forms of any actual S. are determined by its historical traditions.

Nearly all the known definitions of a S. assume that the S.-force prevails only within prescribed territorial limits. But in this connection a distinction is to be drawn between 'sovereignty' *simpliciter* and territorial sovereignty, which latter is at the basis of modern international law. On its negative side S. sovereignty (q.v.) connotes the right of the S. to exclude every other S. or power from sovereignty in or interference with its ter., and hence no modern S. permits any foreign power to exercise any jurisdiction or police powers within its ter. (See also CAPITULATIONS and FOREIGN JURISDICTION.) This rigid insistence on exclusiveness is the primary condition of such a status among the family of nations as alone makes it possible for any given S. to deal on equal terms with another sovereign S. But from the point of view of the subjects of a S. absolute sovereignty of their immediate ruler with respect to all other S. is not essential, e.g. in protectorates the external part of sovereignty resides or may to a large extent reside in another S.—the suzerain S. (see SUZERAIN). Egypt, until recent years, was a S. occupying the somewhat paradoxical position of what has been called a *mi-souverain* S. It formed part of a combination of S. on unequal terms, the titular head of which was the khedive, nominally under the control of Turkey but actually directed by Great Britain through its commissioner.



*Composite Forms of State.*—In contradistinction to *simple* and *unitary* Ss., Ss. which consist of component parts organised like Ss. are called *composite* Ss. In these there is a distinction between the power of the collective or chief S. and the independence of the separate Ss. or dependencies. Composite Ss. are commonly classified into: (1) Federations or federal empires, e.g. the U.S.A. and pre-republican Germany. Both the collective and the particular Ss. have a complete organisation and polity, but their constitutions are generally limited by the overriding power of the organised nation, the constitution of which is generally written and 'rigid,' and appropriates to the national legislature and executive exclusive power in regard to certain well-defined spheres of action, more especially in foreign affairs and taxation. (See further under FEDERATION and FEDERAL STATES.) (2) Confederations, e.g. the Ger. Confederation of 1815, 'a conglomeration of states, each having its own organisation,' and severally independent in all or most matters except external or foreign relations. A confederation insists on the individual independence of each component, while federation insists on the supremacy of the common gov. (See further under CONFEDERATION.) (3) Suzerainties and protectorates. The Holy Rom. Empire exercised a general dominion over a number of vassal Ss., while modern examples are furnished by many African protectorates. These may be regarded as nothing less than inchoate colonial dependencies of the protecting power. (See further under PROTECTORATE.) (4) Ss. and colonial dependencies in absolute subjection to a mother country.

*Relation of the State to Individuals.*—Membership of a S. is usually acquired by birth, marriage, or naturalisation. Most nations recognise nationality as a personal relation, not wholly dependent on place of birth or domicile of origin, but also partly on descent from members of the nation. A person ceases to belong to a S. by marriage (i.e. a wife who acquires the nationality of an alien loses her former nationality), and free renunciation, e.g. by emigration with no *animus revertendi*. Nationality is chiefly of importance in regard to conscription or compulsory service, and restriction on the exercise of certain handicrafts and retail trades. In England no alien can own any share in a Brit. ship (see MERCHANT SHIPPING). Political rights and the right to own land are for the most part granted in most modern Ss. to aliens. See also ANARCHISM; GOVERNMENT; POLITICS; SOVEREIGNTY.

See J. Locke, *Two Treatises on Government*, 1687; J. G. Fichte, *Beiträge zur Staatslehre*, 1820, and *Staatsphilosophie* (ed. by R. Strecker), 1917; Viscount Bryce, *The American Commonwealth*, 1888; J. H. Muirhead, *The Service of the State: Four Lectures on the Political Teaching of T. H. Green*, 1908; R. M. McIver, *Community: a Sociological Study, 1917, and Society*, 1931; L. T. Hobhouse, *Metaphysical Theory of the State*, 1918; H. J. Laski, *Authority in the Modern State*,

1919, *Foundations of Sovereignty*, 1921, *Liberty in the Modern State*, 1930, and *The State in Theory and Practice*, 1935; A. V. Dicey, *Law of the Constitution* (9th ed.), 1929; H. Finer, *The Theory and Practice of Modern Government*, 1932; V. I. Lenin, *State and Revolution*, 1933; R. H. S. Crossman, *Government and the Governed*, 1939; W. Jennings, *British Constitution*, 1941; H. D. Lindsay, *The Modern Democratic State*, 1943; W. Friedmann, *The Crisis of the National State*, 1943; T. D. Weldon, *States and Morals*, 1946; and K. C. Wheare, *Federal Government* 1946.

*State, Acts of*, term used in law, but of somewhat vague import. It would appear to signify (1) an act done or adopted by the prince or rulers of a foreign independent state in their political and sovereign capacity, and within the limits of their *de facto* (actual) political sovereignty (q.v.); (2) more particularly, 'an act injurious to the person or to the property of some person who is not at the time of that act a subject of his (or her) majesty; which act is done by any representative of his majesty's authority, civil or military, and is either previously sanctioned, or subsequently ratified by his majesty' (Sir James Stephen), such sanction or ratification being expressed in the proper manner through responsible ministers. It is settled law that no action of tort lies in respect of an act of state. Eng. courts do not discuss acts of these kinds, because the transactions of independent states between each other (and with subjects of other states) are governed by other laws than those which municipal courts administer. In short, as between the sovereign and his subjects there can be no such thing as an act of state, and there is a long line of estab. decisions in the Eng. courts to show that if one Brit. subject puts another to death or damages his property, the king's express command is no protection unless the act is in itself lawful. There is, however, a distinct point of jurisdiction in connection with which the term act of state is used. A sovereign prince or other person representing a foreign power is not liable to be sued in the courts of this country for acts done in a sovereign capacity. The result of decisions in our courts seems to be that an act done by the authority of the gov. of a sovereign state is not examinable at all in the courts of any other state. So far as an act of state affects persons not subject to the gov. in question, it is not examinable in the ordinary courts of that state itself. If and so far as it affects a subject of the same state, it may be, and in England it is, examinable by the courts in their ordinary jurisdiction. In most continental countries, however, if not in all, the remedy for such acts must be sought before a special tribunal (in France the Conseil d'Etat). See further DROIT ADMINISTRATIF.

*State or District Attorney of the U.S.A.* is an officer appointed in each judicial dist., whose duty it is to prosecute in such dist. all delinquents for crimes and offences cognisable under the authority of the U.S.A.,

and all civil actions in which the U.S.A. are concerned, except in the Supreme Court. The officer who represents the state in criminal proceedings within a particular co. is also, in some of the states, called state or dist. attorney. As a prosecuting attorney, the S. A. is a quasi judicial officer and stands indifferent between the accused and any private interest (51 *Michigan Reports*, 422). In a prosecution for a crime in which there is no question of vindicating the public wrong, the proceedings are always initiated by a S. A., who thus takes the place of the private prosecutor in England.

**State Church, or Established Church**, one estab. by custom or legislation as the official church of the country. Its services are made use of on those occasions when the need of a religious ceremony is felt by the State. In return the Church always recognises the head of the State in some way (see CONCORDAT). In England and Scotland there are estab. churches, both under the authority of Parliament. The Eng. Church was disestablished in Ireland in 1869 and in Wales in 1919. In Eire Rom. Catholicism is the religion made use of by the State on suitable occasions, but it enjoys no special emoluments.

**State Department**, executive dept. of the U.S.A. The Dept. of Foreign Affairs, created on July 27, 1789, was renamed S. D. on Sept. 15. Under the President the S. D. conducts foreign affairs, relations with foreign representatives, and correspondence with U.S. public ministers and consuls. The staff numbers some 7600.

**Staten Island**, is. of New York, U.S.A., co-extensive with the bor. of Richmond. It is some 14 m. long and has an area of over 65 sq. m. It is cut off from Long Is. on the E. by the Narrows, which S. I. commands by Forts Tompkins and Wadsworth, and from New Jersey on the W. by Arthur Kill, and on the N. by Kill van Kull. The chief tns. are New Brighton, Port Richmond, and W. New Brighton. There are shipyards, oil refineries, smelting, and metal works, and market gardens. Pop. 174,100.

**Stater** (lit. 'a standard coin'), largest gold piece in common use in anc. Greece. Many of them reached W. Europe as spoil of war. The victory of Athenobarbus over the Arverni, A.D. 121, brought them to Gaul, and the coinage of Britain in the Early Iron Age was copied from that of the tribes of N. Gaul, itself in turn copied from Gk. S.

**States-General**: 1. Name given to the various legislative assemblies of France prior to the revolution: (1) The *États-généraux* of 1313, which estab. at least in principle, 'that the free consent of the three orders of the realm is necessary to the levying of taxation.' (2) The *États de la langue d'oc*, which assembled at Toulouse, and that of *la langue d'oïl*, which met at Paris (1356). (3) *États de 1357*, an extreme radical assembly which demanded the abolition of the inalienability of crown demesne lands, the extirpation of corruption in the distribution of judicial posts, and the right to create a commission of thirty-six members to ad-

minister the affairs of the whole kingdom. (4) *États de Paris* (1413), convoked by Charles VI. ostensibly to reform abuses but in reality to exact subsidies. (5) *États d'Orléans* (1439), which estab. an ann. tallage of £1,200,000 for the maintenance of a permanent army. (6) *États de Tours* (1484), notable for the declaration in a remarkable speech by Philippe Pot, a Burgundian deputy, of the principle of popular sovereignty. (7) The *États de Paris* (1614) did not meet again till 1785. These were strictly the last S.-G. held in France, for in 1789 they were transformed into the National Assembly. 2. Legislative body of the Netherlands (*q.v.*) which in 1814 superseded the National Assembly estab. in 1795 in place of the old S.-G. of the United Provs.

**States of the Church**, see CHURCH, STATES OF THE.

**State Trading**, term applied to trading functions (buying and selling either at home or abroad) being carried out by the state. It should be distinguished from state control (where the gov. lays down conditions as to price, quantities, etc., under which trade may be carried out) and from nationalisation of industry and transport, where the existing enterprises (*e.g.* the coal-mines, the electricity and gas undertakings, and the transport undertakings) are taken over by the state with compensation. S. T. naturally plays a great part in Soviet Russia's economy and as far as foreign trade is concerned, this is directed less on economic principles and, more to suit Russia's political aims of the moment; thus at the time of the depression of the 1930s sudden Russian sales of grain and timber aggravated the price fall in the markets of the W. world.

In Britain S. T. received a great impetus during the First World War, and a still greater during the Second World War, when the buying and selling of most industrial raw materials and foodstuffs were undertaken by the state in the interest of the national war effort, but it has not yet been shown to be an efficient instrument for solving peace-time economic problems. In the First World War S. T. was gradually extended to most foodstuffs and practically all imports. These and other extensions of state interference were, on the whole, welcomed by the public since it was felt that no private inconvenience should stand in the way of military efficiency. After the First World War it was realised that in the event of another emergency an even greater degree of state interference with economic activities would be required. However, the general opinion was that the war experience had not proved that S. T. possessed any permanent advantage over the existing private capitalistic system under normal conditions. In spite of some striking successes which S. T. achieved during the First World War, there can be no doubt that the new function the state assumed would have miscarried but for the assistance secured from experts in private organisations.

During the Second World War S. T. assumed even larger proportions than

during the First World War. Trade in all foodstuffs was concentrated in the hands of the Ministry of Food, and industrial materials were bought and sold by the Ministry of Supply and the Board of Trade. All these depts. used the existing private firms as agents, and there is again no doubt that the success the ministries achieved during the war was due to the advice they received from traders with long experience.

There are sev. ways of carrying out S. T. The dept. concerned may make a contract for an individual lot of a commodity (e.g. oranges) or it may buy in advance at a fixed price the production of a period ahead (e.g. six-month contracts for metals produced in the empire), or definite quantities of certain goods at prices determined in advance for sev. years ahead, the so-called long-term contracts, the commonly used expression bulk-buying includes all forms of state-buying except the buying of occasional lots.

The Labour party stated before the end of the Second World War that it intended to continue S. T. in times of peace. The Ministry of Food therefore continued to buy most foodstuffs, the Ministry of Supply non-ferrous metals, and the Board of Trade raw materials such as timber and hides. In addition the gov. estab. in 1916 the Raw Cotton Commission to replace permanently the Liverpool Cotton Exchange. During the shortages of the immediate post-war period long-term contracts permitted Britain to buy more cheaply than she would have otherwise done in a period of rising prices. When, however, goods became more plentiful and world prices began to fall, this advantage had gone. Since 1949, and even more since the general election of 1950, there has been a gradual diminution of S. T., though, in addition to cotton and softwood, metals (except tin) and the rationed basic foodstuffs were still subject to S. T. in June 1950.

**Static**, *see under* EVERLASTING FLOWERS.

**Statics**, branch of dynamics which deals with the action of forces in compelling a body to remain at rest or not alter its motion. The basis of the science is contained in Newton's *Laws of Motion* (q.v.), from which are deduced the following axioms. (1) matter possesses inertia, and requires force to move it or change its motion; (2) each force is independent, and can be used as a means of finding the effects of sev. forces; (3) force is transmissible, that is, it may be regarded as applied at any point in its line of action. When forces act in the same straight line, the necessary condition of equilibrium is that the algebraical sum of the forces is equal to zero. When two forces acting on a particle do not act in the same straight line the resultant of the forces may be measured by the diagonal of the parallelogram whose sides are parallel to the directions of and proportional to the forces. This leads to the condition of equilibrium illustrated by the important proposition known as the *triangle of forces*, that is, if

three forces acting at a point can be represented in magnitude and direction by the sides of a triangle taken in order, the forces are in equilibrium. This proposition may be extended to include any number of forces as the *polygon of forces*. It should be noticed that the forces need not be in one plane. When the lines of action of the forces acting in one plane upon a rigid body are parallel, the conditions of equilibrium are that the algebraical sum of the forces is zero, and the sum of their moments about any point in their plane is zero. If the forces are not coplanar, their algebraical sum must be zero, and the sum of their moments about any line in a plane perpendicular to the forces must be zero. The most general principle, applying to any number of given forces, is that the sum of the components along each of three non-coplanar directions must be zero, and the moments of the forces about each of the three directions must be zero in order to produce equilibrium. *See also* GRAPHIC STATICS.

**Stationers' Hall and Company**, institution for the registration of copyright. The Stationers' Company, of which the hall is an outcome, was incorporated in the middle of the sixteenth century for censorship purposes, for the better attainment of which object no printing presses were allowed to be set up without notice to the company. *See* COPYRIGHT.

**Stationery Office, His Majesty's**, Brit. Gov.'s central organisation, estab. 1786, for the supply of printing, binding, office supplies and machinery, pub. books and periodicals for the public service at home and abroad; it also undertakes duplicating and distributing services for gov. depts. and advises them on production and storage of films. The S. O. is the publisher for the gov. and has offices for the sale of gov. pubs. in London, Edinburgh, Cardiff, Manchester, Bristol, and Birmingham; leading booksellers in the larger towns act as agents. The controller is under letters patent the king's printer of Acts of Parliament and in him is vested the copyright in all Brit. Gov. documents. In general, supplies are obtained from commercial sources by competitive tender or long-term contracts. About one-third of printing requirements are, however, obtained from the S. O. printing factories whose output includes telephone directories, rationing documents, and insurance and savings stamps. The wide and varied range of gov. pubs. includes the *London Gazette* which has been issued twice weekly since 1665, and *Hansard*, the verbatim report of both Houses of Parliament.

**Stations** (in liturgy) (Lat. *stationes*), name originally referred to the lengthy services held in the early Church on fast days, viz. Wednesday and Friday, and during which the faithful had to stand (*stare*); these came to be known as 'station days.' By a natural development the name was transferred to the church in which the liturgy was held. In the fifth century at Rome and elsewhere, whenever the liturgy was to be celebrated a special church was appointed, and came to be known as the 'station church.' A

procession usually preceded the liturgy, and gave rise to the phrase 'statio ad . . .', meaning 'procession to . . .', the church in question. In this form the direction for Sundays and the older liturgical days have survived in the Roman missal.

**Stations, or Way, of the Cross**, late medieval devotion, originating in the pilgrimages to the Holy Land. In the fifteenth and sixteenth centuries in certain cities of Europe an exact topographical reproduction of the points of devotional interest seen by pilgrims in Jerusalem was attempted by means of shrines in various parts of the city. Reproductions subsequently lost all attempt at topographical meaning and, shrinking in size, came to consist of images or pictures showing various scenes from Christ's journey to Calvary. As such they eventually found permanent form, and are found as pictures on the walls inside Roman Catholic churches. They are fourteen in number, and the devotion consists in going from one to another and saying appropriate prayers at each. Sometimes fourteen crosses are erected without pictures, but the devotion is made in the same way. See H. Thurston, *The Stations of the Cross*, 1906.

**Statistics**, method of demonstrating facts concerning the social life of man based upon the quantitative observation of aggregates. The term is derived from *status*, in the sense of state or area of government, and was originally applied to any inquiry concerning the social or political conditions of the people without any particular regard to quantity. A nation or community naturally changes from minute to minute as regards the individuals composing it, but a careful study of aggregates shows that it possesses certain permanent features, or at any rate features that change gradually in a typical manner. The usefulness of figures may be admitted, since in a large community no observer or group of observers can apprehend any great social fact without their aid, yet their use is accompanied with certain dangers, usually in connection with the ignorant application of various aggregates, so that it is said that 'figures can prove anything.' Nearly every important country has now a statistical bureau engaged in preparing figures likely to be of use in connection with administration, trade, etc. In the United Kingdom the Central Statistical Office in conjunction with the statistical divs. of gov. depts. prepares two regular statistical pubs.—the *Monthly Digest of Statistics* and the *Annual Abstract of Statistics*, covering all the main statistical fields. In addition, many of the prin. depts., notably the Board of Trade, Ministry of Labour and National Service, and General Register Offices, publish detailed S. in their own particular fields of interest. See R. A. Fisher, *Statistical Methods for Research Workers*, 1925; H. M. Walker, *History of Statistical Method*, 1929; L. H. C. Tippett, *Statistics*, 1943; G. U. Yule and M. G. Kendall, *Introduction to the Theory of Statistics*, 1945; F. E. Croxton and D. J. Cowden, *Applied*

*General Statistics*; and M. G. Kendall, *The Advanced Theory of Statistics*, vol. i, 1945, and vol. ii, 1946.

**Statuary**, see SCULPTURE.

**Statute**, see ACT.

**Statute Law Revision**. It is a commonplace of Eng. jurisprudence that no Act of Parliament can become inoperative by mere desuetude, however inapplicable its provisions might be to modern conditions. Prior to the Statute Law Revision Acts, an Act was only inoperative either directly by express repeal, or indirectly, by the existence of some subsequent Act containing provisions inconsistent with the tenor of the earlier Act. There was a Commons petition in 1610 demanding revision of the statutes, and both Bacon and Coke were engaged for some time on a commission for revision. Earlier statutes, however, are generally simple in character and language, and the most important step was not taken until late in the nineteenth century, by which time the enormous growth in the number of statutes passed every session made periodical revision essential. This resulted in the appointment of the Statute Law Revision Committee of 1868 by Lord Chancellor Cairns for the purpose of overhauling the Statute Rolls, and eliminating therefrom any Acts which time and altered circumstances had rendered obsolete or unnecessary. The outcome, the revised ed. of the statutes is generally known as the *Statutes Revised* (1878). But this ed. necessarily becomes less accurate every year with the appearance of fresh legislation, whence the necessity of frequent Statute Law Revision Acts and of periodical eds. of the *Revised Statutes*. Altogether there have been thirty-two Statute Law Revision Acts. It is to be borne in mind that a Statute Law Revision Act does not alter the law; it simply strikes out certain enactments which have become unnecessary (Robins v. Robins, 1907, 2 K. B.). This is made clearer by the declaratory words in the proviso to section 1 of the Act of 1927 which are to the effect that the repeal of any words or expressions of enactments described in the schedule to the Act will not affect the binding force or construction of any other statute as respects the past or the future; and again, that 'when any Act not in the schedule has been repealed, confirmed, etc., by any Act repealed in the schedule such earlier repeal, confirmation, etc., will not be affected by the repeal effected by the Act of 1927.' Nor does the Act affect the validity, invalidity, effect, consequences, etc., of anything done or suffered or any existing status or equity; nor does it repeal any Act so far as the latter may be in force in the overseas dominions unless otherwise expressly stated. The Statute Law Revision Act of 1948 covers the period 1235 to 1800, while the Act of 1950 extends the process of expurgation up to 1948, thus completing the necessary preliminary to the third ed. Owing to the decision of the N. Ireland Gov. to publish a revised ed. of the statutes affecting N. Ireland, the 1950 Act provides for the omission from the third ed. of *Statutes Revised* of the

statutes relating to matters within the powers of the Parliament of N. Ireland, and a large proportion of the Acts or sections of Acts scheduled in the 1950 Act for repeal relate to N. Ireland. The Act also deals with the revision of the Church Assembly Measures.

**Statute Merchant**, in O.E. law, a bond of record pursuant to an Act of 1285 acknowledged before one of the clerks of the statutes merchant and the mayor or chief warden of London or before certain persons appointed for the purpose; on which, if not paid at the day, an execution might have been awarded against the body, lands, and goods of the obligor. So stringent were the laws against debtors in and after the reign of Edward I., especially in that of Edward III. (see 'capias ad satisfaciendum' under **AUREST**), that such severe laws as the S. M. were rendered unnecessary.

**Statute of Frauds**, see **FRAUDS**, **STATUTE OF**, 1677.

**Staunton**: 1. Co. seat of Augusta co., Virginia, U.S.A., 135 m. by rail W.N.W. of Richmond. \* The Virginia school for the deaf and blind is here, and it is the bp. of Woodrow Wilson. The tn. was the first to use the commission form of gov. under a city manager. Agric. hnaplements, flour, and bricks are produced. Pop. 13,300. 2. Coal-mining centre in Macoupin co., Illinois, U.S.A., 30 m. N.W. of St. Louis. Pop. 5000.

**Stavanger**, fort. city in the prov. of Rogaland, Norway, on Bokufjord, 100 m. S. of Bergen, founded in the eighth or ninth century. The battle which united Norway under one ruler (Harald Haarfagr) for the first time occurred at Hafrstjord in 872. It has a splendid Gothic cathedral built by Bishop Remald from Winchester in the twelfth century. It was rebuilt after a fire in 1272 and restored in 1886. S. is the centre of a sheep-farming area, exports large quantities of fish, and has the world's largest fish-canning industry, with more than 100 factories. S. is also a centre of the fish-curing trade, and has iron foundries, and shipyards, and Hille contains important mineral deposits, including calcium phosphates (*apatite*). S. possesses a modern airport, Sola, nearest to Britain, which the Gers. used as a base for bombing raids on allied shipping. It was the bp. of the great novelist Alexander Kielland (1849-1906) and the philosopher Henrik Steffens (1773-1845).

**Stave**, or **Staff**, see **MUSIC**.

**Stavesacre**, or **Delphinium Staphisagria**, see **DELPHINIUM**.

**Stavisky, Serge** (1866-1934), naturalised Frenchman, of Russian birth, responsible for a financial scandal in France in 1934. He floated a very large sum in bogus bonds, in the name of the municipal credit estab. of Bayonne. S. committed suicide after a warrant for his arrest had been issued. The scandal caused the fall of two govts., and a general strike and riots in Paris.

**Stavropol**: 1. Ter. of the R.S.F.S.R., to the N. of the Caucasus, watered by the Egoriyk, Kalaus, and Kuma Rs. It is part of the pre-Caucasus upland, and includes a plateau some 2000 ft. in height.

2. Cap. of the above, now called Voroshilovsk (q.v.).

**Stawell**, tn. in Borung co., Victoria, Australia, 150 m. W.N.W. of Melbourne. It lies in an agric. area with wheat, oats, and merino sheep, and there are gold mines and freestone quarries. The tn. has woollen, cotton, timber, and flour mills, and brickworks. Pop. 4900.

**Stead, William Thomas** (1849-1912), Eng. journalist, b. at Embleton, Northumberland, the son of a Congregational minister. In 1871 he became editor of the *Darlington Northern Echo*, and, coming to London, was appointed assistant editor of the *Pall Mall Gazette* in 1880, and succeeded John Morley in the editorial chair in 1883. His series of articles on the *Maiden Tribute to Modern Babylon* on the white slave traffic, though it secured the passing of the Criminal Law Amendment Act, 1885 (raising from thirteen the 'age of consent' to seduction), resulted in his spending three months in Holloway jail. He did much to bring about the dispatch of Gordon to the Sudan. He left the *Pall Mall* in 1889, and subsequently founded the *Review of Reviews* (1890), the magazine being a new feature in Brit. journalism; *Borderland*, a spiritualistic organ (1893-97); the *Daily Paper* (1904); *Books for the Bairs*; *Penny Poets*; and *Penny Classics*. S. was at first an imperialist (and a co-heir of Rhodes), but became a firm opponent of the South African war. He wished to see a strong Brit. Navy, was a strong advocate of peace, and in later years a spiritualist. He wrote fluently and vigorously on all manner of subjects, his works including *The Truth about Russia* (1888); *The Pope and the New Era* (1889); *If Christ came to Chicago* (1893); and *Mrs. Booth* (1900). He was one of those drowned in the *Titanic*. See lives by Estelle Stead, 1913, and F. Whyte, 1925.

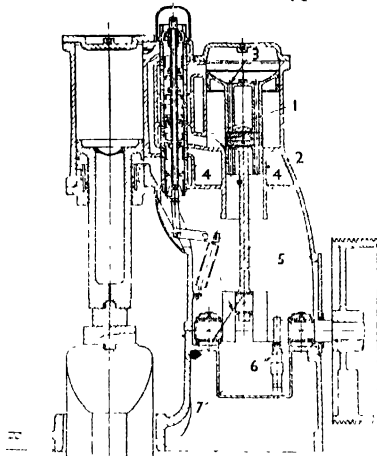
**Stealing**, see **LARCENY**.

**Steam**, dry, colourless, and transparent gaseous substance, formed when water is vaporised. (Note that the wet white cloud that is often wrongly called S. consists of small drops of water, condensed from S. by a surrounding cold atmosphere.) S. is given off from the surface of water at all temps., as long as the space above it is unsaturated. Saturation is reached at a given temp., when a slight cooling causes the formation of water again. At every temp. water has a corresponding vapour pressure; if this is less than the external pressure, S. will evaporate quietly from the surface of the water. If it reaches the same value as the external pressure, the water will change into S., not only at the surface, but throughout its mass, and we get the phenomenon of 'ebullition.' Hence for any given external pressure, there is a definite temp. at which ebullition occurs. At atmospheric pressure (14.7 lb. per sq. in.) the temp. required is 100°C.; at a pressure of 227 lb. per sq. in. the temp. required is 200°C. At the 'critical' pressure (3650 lb. per sq. in.), where S. is so compressed that it has the same density as water, and therefore cannot be distinguished from it,

the corresponding temp. is 380.5° C. S. in the presence of water is called 'saturated' (this is a technical term, and does not imply that the S. is wet). If S. is taken away from the presence of water and heated, it becomes 'superheated,' and approximately obeys the laws governing the expansion of gases. To convert unit weight of water at the point of ebullition (or boiling-point) into S. at the same temp. requires a definite amount of heat energy, called the 'latent heat of evaporation'; this is dependent only on the temp. being 595 C.Th.U. per lb. at 0° C., 539 C.Th.U. per lb. at 100° C., 466 C.Th.U. per lb. at 200° C., and zero at the critical point. (C.Th.U. = Centigrade Thermal Unit = the amount of heat required to raise the temp. of 1 lb. of water through 1° C. at normal temps.) Thus the latent heat falls as the temp. rises. But to convert cold water into steam at any pressure heat must be applied to raise the water to the boiling-point, in addition to the latent heat; and this increases as the temp. rises. The heat required to raise unit weight of water from freezing-point (0° C.) to boiling-point is called the 'total heat of water' at the boiling-point temp., and this, added to the corresponding latent heat, gives the 'total heat of S.' at the same temp. This increases from 595 C.Th.U. per lb. at 0° C., and 539 C.Th.U. per lb. at 100° C., to a maximum of 673.5 C.Th.U. per lb. at 241° C. (corresponding to a pressure of 500 lb. per sq. in.), and then falls to 470 C.Th.U. per lb. at the critical point. The 'specific volume' of S. at ordinary temps. is much greater than that of water, being 26.8 cub. ft. per lb. at 100° C., as compared with water 0.017 cub. ft. per lb.—or 1600 times as great. It falls rapidly as the temp. and pressure increase, being 2.02 cub. ft. per lb. at 200° C.; and at the critical point the specific volumes of S. and water become equal at 0.041 cub. ft. per lb. A further property of S. is its 'entropy,' an abstract mathematical function much used in S.-engine design, which remains constant when S. expands under ideal conditions. All the properties of S. mentioned above are tabulated at great length in 'Steam Tables.' S. is used for heating purposes, because of its large latent heat of vaporisation, which is given up on condensation. It is also used as a disinfectant and a fire-extinguisher, but one of its principal uses is in S. engines, S. hammers, etc. (q.v.). See H. L. Callendar, *Properties of Steam and Thermodynamic Theory of Turbines*, 1920, and J. A. Ewing, *Thermodynamics for Engineers*, 1920.

**Steam and Power Hammers.** Among the many ideas of James Watt in connection with his study of steam engines was one resulting in a patent (1784) for a steam hammer. Wm. Deverell of Surrey, also took out a patent in 1806. The first machine in actual use (1842) was constructed by Bourdon, mechanical engineer of the Creusot works in France, after designs sketched by James Nasmyth. The sketch showed an inverted cylinder, mounted in a heavy frame, with a heavy block of iron on the end of the piston-rod. The block was raised by admitting steam

under the piston and released by an attendant who allowed the steam to escape. The mass fell under the action of gravity on to the anvil below. Nasmyth's own first steam hammer was soon constructed; the block, weighing 30 cwt., had a clear fall of 4 ft. In 1843 steam was admitted above the piston to aid gravitation, and automatic gear was tried but abandoned. The next hammer had a weight of 5 tons and a fall of 5 ft. The invention made possible the forging of very much larger masses of iron as a whole—for instance, large, reliable anchors could be made. The next application



B & S Massey Ltd  
SECTIONAL VIEW OF A 5-CWT.  
PNEUMATIC HAMMER

scrape hole for balancing bottom air pressure, scrape hole for balancing top air pressure, oil supply to small end, 4, air reservoir; 5, duct to crankshaft, carrying high pressure oil to big end; 6, oil pump driven from crankshaft; 7, sum from which oil is supplied to all bearings and cylinders; used oil returns to this sump and is automatically filtered ready for recirculating.

was for pile-driving, the hammer of 4 tons weight giving eighty blows to the minute. It also gave rise to the 'Infant Hercules' or 'steam hammer engine,' the crank being placed in the position of the anvil. In 1845 the V anvil was produced. A more modern development is the self-acting Massey steam hammer, made in weights ranging from 10 to 25 cwt. A curved lever is moved automatically by a roller on the hammer during the up and down movement of the tup or hammer, admitting steam alternately above and below the hammer piston. A hand-lever, which can be set in any of a range of notches, varies the movement of the valve-rod, and consequently alters the stroke of the hammer. A stop-valve controlled by a hand- or foot-lever regulates the amount of steam admitted and therefore the force of the blows. In place



cut-off (CO), when the valve closes, and the steam begins to expand. When the steam pressure has fallen sufficiently, due to expansion, the exhaust valve opens, at the point of release (R); pre-release is necessary, to give the steam time to leave the cylinder before front dead centre (FDC) is reached, and the return stroke begun. Exhaust steam is much more sluggish than live steam, and pre-release is therefore always considerably greater than pre-admission. The exhaust-valve stays open on the return stroke until the point of compression (C). From here till the point of admission (A) the residual exhaust steam is compressed in this way: (1) the clearance volume at the end of the cylinder does not need to be filled with live steam at the beginning of each stroke; (2) the

overlaps the inside edge is called the exhaust lap—the negative exhaust lap is called exhaust clearance. The first slide-valves had no lap (as in Fig. 2 A), and therefore steam could not be used extensively. A large steam lap gives an early cut-off, and also makes the points of release and compression earlier. Exhaust lap makes the point of release later and the point of compression earlier; exhaust clearance has the opposite effect. Slide-valves are still sometimes used in locomotives. The slide-valve has two main disadvantages: (1) the steam and exhaust events are interdependent; this is unimportant at cut-offs later than 25 per cent of the stroke, but becomes troublesome at early cut-offs. One solution, now obsolete, is the cut-off valve, a flat valve

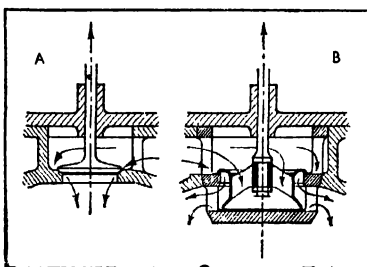
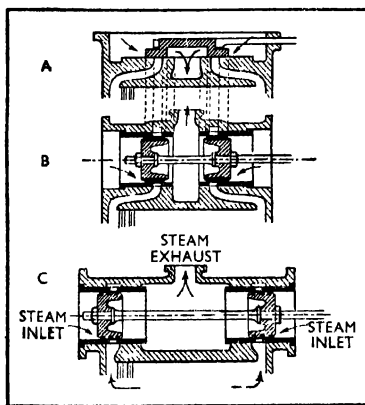


FIG. 4. POPPET-, LIFT-, OR DROP-VALVES  
A, single-beat; B, double-beat

FIG. 3 (left). PISTON SLIDE-VALVES  
Comparison of A slide-valve with Cap, and B piston-valve; C, piston slide-valve with spaced-pistons.

moving parts are slowed down by increasing resistance to motion due to compression prior to the reversal of direction of movement at back dead centre, thus promoting smooth running. A similar cycle of operations takes place at the front end of the cylinder.

**Valves.**—In the earliest engines, steam was controlled by two cocks at each end of the cylinder, one for admission and one for exhaust, which were opened and closed in turn to admit and release the steam. The four cocks were soon replaced by a single slide-valve (Fig. 2 (A)), consisting of an open box of cast iron, brass, or gunmetal, sliding face down on a flat surface, in which are two steam ports leading to the two ends of the cylinder, and between them an exhaust port leading to the atmosphere or to a condenser. The valve is kept seated on the port face by the pressure of steam outside it. When it is moved to one side (the position shown in Fig. 1), one steam port is opened to live steam, and the other to the exhaust port, via the hollow inside of the valve. When it is in its central position, the amount that it overlaps the outside edge of the steam port is called the steam lap (Fig. 2 (B)), while the amount that it

working on the back of an ordinary slide-valve (Fig. 2 (C)) to shut off steam from the main valve before the latter has reached its real point of cut-off on the port face, without affecting the points of admission, release, and compression. To obtain early cut-offs satisfactorily, poppet-valves and some form of drop gear are necessary (see below). (2) The pressure of steam on the back of the slide-valve is more than enough to keep it steam-tight, and the resulting friction causes wear of valve and port face, and absorbs much power; to avoid this, the balanced slide-valve, in which part of the back of the valve is relieved of steam pressure, was invented (Fig. 2 (D)). It is very complicated and liable to leakage; it was formerly used on Amer. locomotives. A more modern solution is the piston-valve, consisting of two small pistons on the same spindle, working in a cylindrical steam chest, in which steam and exhaust ports are cut, exactly as in the flat port face on which the slide-valve works. Fig 3 (A and B) shows the essential resemblance between the slide-valve and the piston-valve. The latter is perfectly balanced, and comparatively frictionless, but depends on piston rings for steam-tightness, and so is liable



to leak. In the piston-valve the pistons can be well spaced out, and the steam ports correspondingly shortened (Fig. 3 (c)) to reduce steam losses; this is impossible with the slide-valve, owing to the large area thereby exposed to live steam pressure, and consequent friction. Piston-valves are standard practice on modern locomotives and marine engines using superheated steam. Unlike wet steam, this has no lubricating properties, and slide-valves are liable to score the port face if oiling is not carefully watched. The Corliss engine was a reversion to the original idea of four independent valves per cylinder; it used cylindrical valves, with a rotary motion like plug cocks, but having passages specially shaped to give large port openings. Corliss engines are no longer made, but independent steam and exhaust-valves are standard practice nowadays on high-efficiency stationary engines; poppet-valves or lift- or drop-valves, which come down on to a seat, as in internal-combustion engine practice, are used instead of valves with a sliding or rotating action. Such valves require very little force to move them, give a large valve opening with a small lift, are easy to make and maintain steam-tight, and by means of cams can be made to open and close exactly as the designer wishes. Single-beat valves (Fig. 1 (A)) are used in steam lorries, but balanced double-beat valves (Fig. 4 (B)) are the general rule in the stationary practice. Double-beat valves are also used on locomotives.

**Valve Gears.**—On the very earliest engines the steam and exhaust cocks were turned on and off by a boy; but a linkage from the engine mechanism, which knocked the cocks on and off in correct sequence, was soon found more efficient. The early slide-valves were worked by an eccentric (a specialised form of crank) placed at right angles to the main crank, so that, at dead centre, the valve was in its mid position, closing both steam ports. To give pre-admission, however, the valve should be open at dead centre by a small amount called the lead, which means that it should be displaced from its mid position by an amount = (steam lap + lead); this is done by shifting the eccentric on the shaft relatively to the crank, so that the angle between them is greater than a right angle; this extra angle is called the angle of advance. A single eccentric, set in this manner, gives only one direction of rotation, and to make the engine reversible a large number of different valve gears have been invented. It is seen (Fig. 1) that the eccentric always leads the crank; to run backwards there must be a second eccentric similarly set on the other side of the crank and means for driving the valve from it. In the first reversing gear, the gib gear, the two eccentric rods terminated in hooks, either of which could be made to engage with a pin on the valve rod. In the Stephenson gear (Fig. 5 (A)), the ends of the two eccentric rods were connected by a curved link, in which worked a slide block and pin attached to the valve rod. The link and eccentric

rods were lifted up or down so that the drive to the valve came from either eccentric. It was soon found that, at intermediate positions, the valve gear still functioned, but at an earlier cut-off. Thus the engine could be adjusted for varying loads by 'notching up,' and changing the point of cut-off. Other link gears are the Gooch and the Allan straight link gear. This last was invented when machining methods were crude, and it was difficult to get a curved link made of the correct radius. The next gears were the radial gears, which depend on the geometrical fact that the motion of the two eccentrics

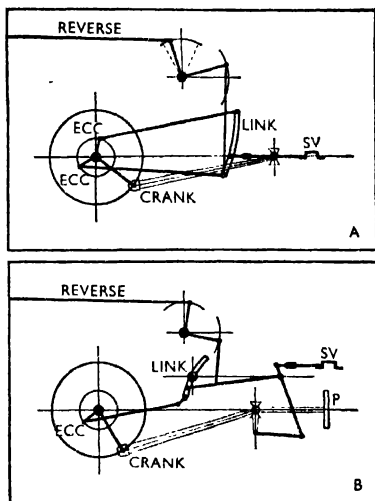


FIG. 5. VALVE GEARS

A, Stephenson (link-motion); B, Walschaerts (radial)

can be represented by: (1) a constant motion in phase with the crosshead or crank -  $2(\text{lap} + \text{lead})$  of the valve; (2) a variable and reversible motion at right angles to the crank. This is clearly shown in the Walschaerts gear (Fig. 5 (B)), where the pendulum lever, worked from the crosshead, provides the 'lap and lead' component, while an eccentric at right angles to the crank provides the variable 'travel' component, through a radius rod and reversing link. This is the standard valve gear for nearly all modern locomotives. Other gears based on the Walschaerts are the Baker and the Helmholz; also the Young and Deeley lever gears for two-cylinder engines. Other radial gears are the Hackworth, Bremme, and Marshall, where one eccentric in line with the crank provides both components of the motion, through an eccentric rod perpendicular to the line of action of the cylinder, and an inclined slide, whose angle of inclination is varied

to alter the cut-off, and to reverse. These gears were used for marine engines, but are unsuitable for locomotives, as the action of the springs disturbs the valve setting. A special radial gear is the Joy, where the motion is taken from a point on the connecting rod, thus avoiding eccentrics altogether. At one time it was used on locomotives, although it is affected by the springs, imposes harmful stresses on the connecting rod, and requires a special correcting linkage to make up for its inherent irregularities of motion. All these valve gears can be used for slide-valves or piston-valves of all sorts. Corliss valves are operated by a special Corliss gear, worked by an eccentric, and regulated by a governor. Poppet-valves on stationary engines are operated by cams on a geared camshaft running alongside the cylinder. The inlet valves usually

flywheel's kinetic energy by a small drop in speed, thus giving an almost uniform motion. The size of the flywheel depends on: (1) the percentage variation in speed allowable throughout the stroke; where this is small, as in engines driving electrical alternators, large flywheels are necessary; (2) the variation in engine torque throughout the stroke; this is large in single-cylinder engines, where the flywheel has to help the engine over dead centre, but small in multi-cylinder engines; (3) the speed of the engine: kinetic energy varies as the square of the speed, so high-speed engines need only small flywheels.

**Governor.**—The governor plays a similar part to the flywheel, but over a longer period of time. Cyclical variations in power are evened out by the flywheel; but if the mean power developed by the engine is greater than the power absorbed by

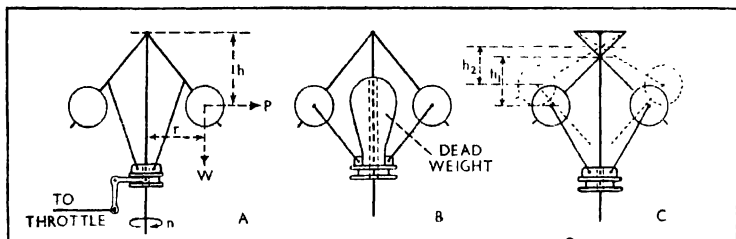


FIG. 6. PRINCIPLE OF GOVERNORS

A, Watt's conical pendulum governor; B, Porter's or loaded governor; C, governor with arms crossed.

$W$  = weight of each ball in poundals.

$W/g$  = mass of each ball in pounds;

$n$  = speed of rotation of spindle,  $n$  revolutions per sec.

$r$  = radius of path in which balls revolve.

$h$  = vertical distance of path below point of suspension of rods on spindle axis.

$P$  = centrifugal force on each ball =  $4\pi^2 n^2 r W/g$

Condition of equilibrium  $Wr = Ph$

$$\therefore Wr = 4\pi^2 n^2 h W/g$$

$$\therefore n^2 h = g/4\pi^2 r$$

have a drop mechanism; i.e. the valve is opened by the cam, against a spring, at the point of admission; at the point of cut-off, the connection between the valve rod and the valve is abruptly broken, and the valve comes sharply on to its seat under the action of the spring, giving a clear-cut point of cut-off without throttling. The valve rod connects with the valve again at its leisure, and opens it at the point of admission on the next stroke. The drop mechanism, and hence the point of cut-off, is controlled by the governor. Poppet-valves for locomotives are controlled by special cam gears, such as the Caprotti and Lentz, both of which are models of ingenuity and compactness.

**Flywheel.**—The pressure of steam acting on the piston of an engine varies continuously throughout the stroke, and would produce a very irregular motion of the engine were it not for the flywheel, a heavy wheel with its mass concentrated at the rim. Any excess of power above the mean is stored in the flywheel as kinetic energy by a small increase in speed, while any defect of power is made up from the

the load, the speed gradually increases; the governor has to detect this and reduce the power of the engine until normal speed is regained, and vice versa. Most governors depend on the action of centrifugal force. A simple Watt governor is shown at Fig. 6 (A). The vertical shaft, carrying two heavy balls at the end of arms, is rotated by some portion of the engine mechanism. Centrifugal force tends to move the balls outward, while the controlling force of gravity tends to move them inward. At any speed an equilibrium is reached; if the speed is increased, or falls short of its normal value, the balls move out as in (r) and so take up a new equilibrium position, thus raising or lowering a collar connected to the throttle-valve through a lever and so controlling the power output of the engine. A governor must be very sensitive to small variations in speed; to increase the sensitivity, a static load may be added to the Watt governor, giving a larger controlling force without altering the centrifugal force (Porter's governor, Fig. 6 (B)), or the arms of the governor may be crossed,

so reducing the variation in height  $h$  (Fig. 6 (c)) and consequently the speed range of the governor, which means increasing its sensitivity. Modern stationary engines employ a spring as controlling force (Fig. 7), as the governor can then be mounted on a horizontal shaft, such as the end of the crank axle; the controlling force also varies with the position of the governor balls, and allows the sensitivity to be arranged to suit the design of engine. An engine may be controlled either by the throttle or by the cut-off. With the former the governor opens or closes a valve in the steam pipe.

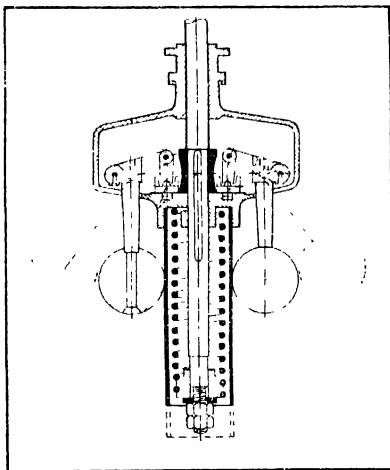


FIG. 7.

## GOVERNOR CONTROLLED BY SPRING

This is very simple and requires little power at the governor, but is uneconomical, as the full pressure of steam is rarely used. In cut-off governing the valve gear is adjusted to give a later or earlier cut-off; with drop-valves the governor controls the point at which the valve is disconnected from the operating gear (see *Valve Gears*). This method is the more economical but is generally more complicated. If a governor is made very sensitive (i.e. a very small change of speed will move it from full open to full closed), hunting, or rhythmic speed variation of the engine, may be set up. This is an objectionable phenomenon, caused by the governor instantly responding to speed variations and over-shooting the mark each time; in such a case the governor must be made less rapid acting, without reducing the sensitivity, by means of an oil dash-pot or other damping device. Then, if the speed rises slightly, the governor tends to shut off steam completely, but must do so slowly because of the dash-pot. Speed then falls to its proper value, but the governor has not

had time to overshoot the mark, and a constant speed is thus maintained.

**THEORY OF THE STEAM ENGINE.**—*Thermodynamics* deals with the relation of heat to mechanical work and gives us a standard with which to compare actual heat engines. There are two fundamental laws: (1) In any heat engine, the amount of mechanical work obtained is strictly equivalent to the amount of heat lost, since heat and work are both forms of energy. 1400 ft.-lb. of work = 1 C.Th.U. (see STEAM), and this is called the Mechanical Equivalent of Heat or Joule's Equivalent, after the man who first determined it. (2) It is impossible for a self-acting machine, unaided by any external energy, to convey heat from a body at lower temp. to a body at higher temp. From these laws it can be deduced that a perfect heat engine, taking in heat at a high temp.  $T_1$ , and rejecting heat at a low temp.  $T_2$ , cannot have a greater

efficiency than  $\frac{T_1 - T_2}{T_1}$  (Carnot's principle).

Temps. for this expression are to be measured from the absolute zero, or temp. below which it is impossible to go ( $-273^\circ \text{C.}$ ): e.g. a locomotive, taking in heat in a boiler working at 227 lb./sq. in. steam pressure (corresponding temp.  $200^\circ \text{C.}$  or  $173^\circ \text{Abs.}$ ), and rejecting heat up the chimney at atmospheric pressure (corresponding temp.  $100^\circ \text{C.}$  or  $373^\circ \text{Abs.}$ ), has a maximum possible thermal efficiency of  $473 - 373$ , or 21.2 per cent. That is,

for every 100 units of heat put into the boiler, at least 78.8 must be thrown away in the steam going up the chimney. As no locomotive is a perfect heat engine, considerably less than 21.2 units are actually made use of; a recent locomotive trial gave an overall thermal efficiency of 8.2 per cent at the drawbar. Thus to increase the efficiency of a steam engine we must raise the temp. at which heat is taken in (e.g. increase the boiler pressure) and lower the temp. at which heat is rejected, by using a condenser, to give an exhaust temp. nearly approaching the atmospheric. It is impossible to exhaust at a temp. below that of the surroundings, as that is contrary to the second law of thermodynamics. By using high-pressure steam in large steam turbines (see TURBINES, STEAM), and exhausting to a high-vacuum condenser, overall thermal efficiencies of 30 per cent have been attained in practice.

**Sources of Loss in a Steam Engine.**—(1) Cylinder condensation. When the valve opens to admission, hot live steam comes in contact with a cylinder piston, and steam port that have been previously cooled by exhaust steam and condensation takes place; more steam is therefore needed to fill the cylinder than calculation from its dimensions would indicate. The difference between the steam actually used and that theoretically necessary is called the missing quantity, and is 20–60 per cent in engines using saturated steam. Further, as the steam in the cylinder expands after cut-off, more condensation

takes place at first; but, as the pressure and temp. both fall, the steam soon becomes cooler than the cylinder walls and condensed water; the latter therefore re-evaporates at the end of the stroke when it is no longer wanted, and congests the exhaust ports, and overloads the condenser (where fitted). Re-evaporation cools the cylinder walls again and prepares them for condensing more steam next stroke, so that a vicious circle is set up. Cylinder condensation is less in a high-speed engine, as the steam has less time to condense and re-evaporate. By superheating the steam (see *BOILERS*) before it is admitted to the engine, initial condensation is avoided, as contact with cold cylinder walls merely reduces the degree of

exhaust-valves of the Corliss or poppet-valve type avoid this, as they are less liable to leakage, and, in any case, steam can only leak into the cylinder and not direct to exhaust. (3) 'Wire-drawing.' With small valves, and long, narrow steam ports, the steam is considerably throttled, both at entering and at leaving the cylinder; this reduces the power of the engine, as a large amount of the steam's energy is employed in getting itself through the ports. The remedy lies with long-travel piston-valves with short, straight ports, or, better, with large-diameter poppet-valves. (4) Incomplete expansion. This is an inherent fault in all condensing S. E. (other than steam turbines). Complete expansion down to

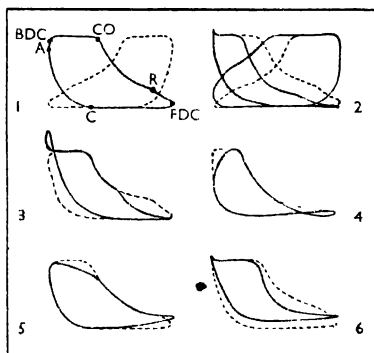
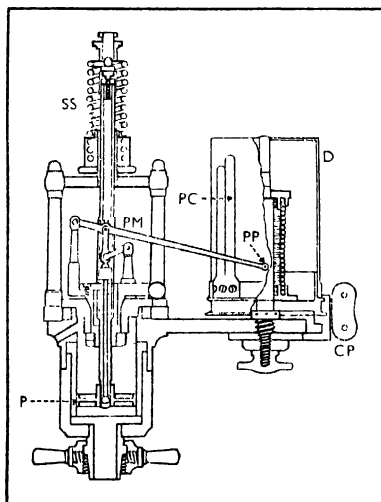


FIG. 9. INDICATOR DIAGRAMS  
For explanation, see text

FIG. 8 (left). SECTIONAL DIAGRAM OF  
CROSBY INDICATOR

SS, spiral spring; D, drum; PC, paper clip; PM, multiplying mechanism; PP, pencil point; CP, cord pulley; P, indicator piston.

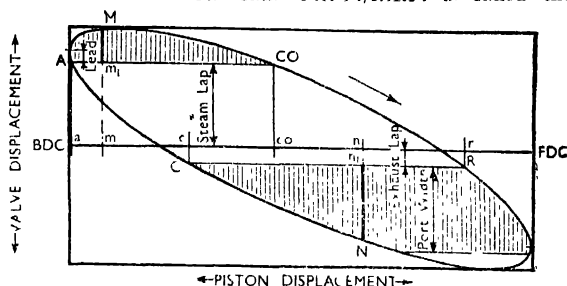
superheat; but condensation occurs during expansion, particularly with large expansions in one cylinder. A very high degree of superheat will prevent condensation entirely, so that slightly superheated steam is exhausted (*cf.* modern locomotives when worked hard); but as the temp. of rejection is thereby increased, the thermal efficiency is reduced. (See also *Compound Engines and Uniflow Engines* below). (2) Leakage of steam past the valves. Where slide- or piston-valves are used with saturated steam, the movement of the valve uncovers portions of the port face that have previously been exposed to exhaust steam; live steam therefore condenses, and the resultant film of water is blown underneath the valve by the difference in pressure between the steam and exhaust sides; once on the exhaust side, it re-evaporates, due to the low pressure, and congests the exhaust passages. This leakage contributes to the missing quantity. Independent steam and

condenser pressure (which may be as low as  $\frac{1}{2}$  lb./sq. in.) is impracticable, owing to the enormous cylinder necessary to accommodate the large volume of expanded steam; apart from limitations of space, the friction of the very large piston and valves required would more than absorb the extra power given by complete expansion; cylinder condensation would also be increased, and 'wire-drawing' would be unavoidable. Condensing engines therefore exhaust at a pressure of 3 to 8 lb. per sq. in. and do not make full use of their steam. (5) Incomplete compression. This is due to faulty valve setting. Where it occurs, the clearance volume at the end of the cylinder must be filled with live steam at the beginning of each stroke, and this steam is included in the missing quantity. (6) Loss of heat by radiation and leakage from steam pipe, cylinder, valve chest, etc. This can be reduced by careful lagging of all parts, and attention to joints. (7) Mechanical friction between piston and cylinder.

valve and port face, and at all sliding surfaces and joints in the mechanism and valve gear. These sources of loss, of which 1 and 4 are the most serious, reduce the indicated thermal efficiency to 50 to 70 per cent of the ideal thermal efficiency; the brake thermal efficiency is, of course, less still

the crank shaft is less than the I.H.P., owing to friction in the engine mechanism; this is called shaft horse power (S.H.P.) or brake horse power (B.H.P.)—the latter because, in a test, the power delivered by the engine is absorbed and measured by a brake acting on the engine shaft. The ratio B.H.P./I.H.P. is called the

FIG. 10  
OVAL DIAGRAM FOR  
THE SLIDE-VALVE  
The small letters *a, m,*  
etc., represent the  
means of the curves.



*Indicators and Testing of Engines*—The indicator is a piece of apparatus used for testing engines. It draws a diagram showing how the pressure in the cylinder varies with the position of the piston throughout the stroke. From the dimensions of an engine, and the indicator diagram, we can calculate the power developed by the steam inside the cylinder; this is called the indicated horse

power of an engine, and generally lies between 60 and 90 per cent. In testing locomotives a dynamometer car is used, placed between the locomotive and its train, to measure the tractive force at the tender coupling, or 'drawbar'; this gives the drawbar horse power (D.H.P.), which is less than the B.H.P. owing to the frictional and wind resistance of the locomotive and tender, considered as vehicles.

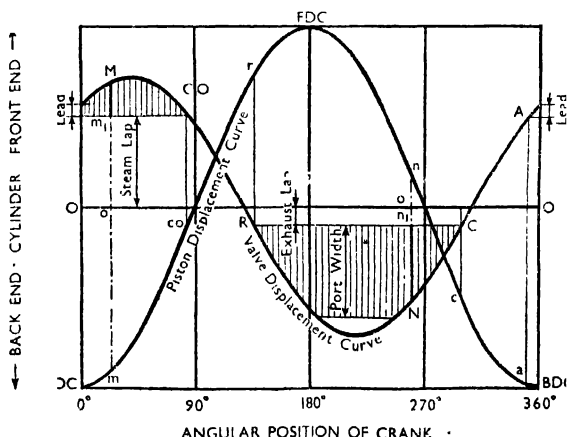


FIG. 11  
HARMONIC OR  
WAVE-FORM DIA-  
GRAM FOR THE  
SLIDE-VALVE  
The shaded portions  
represent the port  
openings to steam and  
exhaust (also in Figs.  
10, 12, and 13).

power (I.H.P.) of the engine (1 h.p. = 33,000 ft.-lb. per min., a figure adopted by Watt as being 50 per cent more than could be done by a good cart-horse, so that his customers should have no cause to complain of the power of their engines). In a condensing engine, the steam used can be weighed in the form of condensate, and the steam consumption calculated. This is expressed as 'lb. steam per I.H.P.-hour.' The power actually delivered at

The indicator diagram is also used to test the setting of the valves and valve gear, as the smallest irregularity makes itself apparent on the diagram. Watt designed the first indicator, from which have developed many different types. In the Crosby indicator (Fig. 8) the drum, carrying a piece of paper held by the paper clips, is rotated from the cross-head of the engine by a reducing lever and pulley. The body of the indicator is screwed into

the cylinder of the engine, which is thus put in steam communication with the indicator piston. This is controlled by a graduated spiral spring SS, and connected to a pencil point by means of a multiplying mechanism. Thus the pencil moving vertically records variations in steam pressure, while the drum in rotating follows the motion of the piston, resulting in an indicator diagram (Fig. 9). (The letters have the same meanings as in Fig. 1.) Two diagrams are usually taken on the same paper, corresponding to the two ends of the cylinder. The area of the diagram represents the work done per stroke to a suitable scale. Indicator diagrams (Fig. 9) show in (2) more work is done at one end of the cylinder than at the other, (3) the points of release and compression are both too early, (4) the point

the other diagrams are used, as they consist solely of straight lines and circles. In the Zeuner diagram, the position of the valve is set off along the crank for each crank position; it can be shown geometrically for an ideal valve gear that the resultant figure is a pair of circles, of diameter equal to half the valve travel, and with centres on an axis inclined to the vertical by an angle equal to the angle of advance of the equivalent eccentric. The Reuleaux diagram consists of one circle of diameter equal to the valve travel; the position of the valve, at any crank position, is the distance from the circumference of the circle to an axis inclined to the horizontal by an angle equal to the distance of advance. In all diagrams, the port openings to steam and exhaust are shown shaded. The points

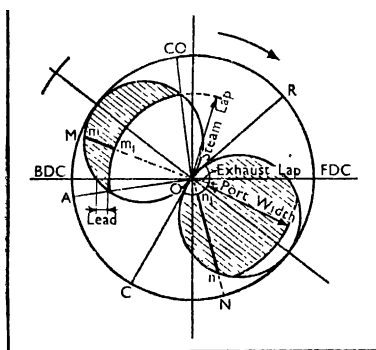


FIG. 12

ZEUNER VALVE DIAGRAM

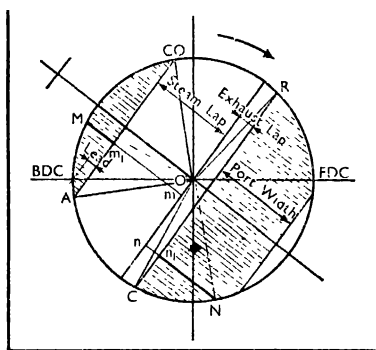


FIG. 13

REULEAUX VALVE DIAGRAM

of admission is too late (lead is negative), and the point of release is too late. In (5) the ports are too small, causing throttling at admission and exhaust; in (6) there is condensation of steam in the cylinder, as shown by the rapid falling away of the expansion line, and excessive back pressure (the correct diagrams are shown by dotted lines).

**Valve Diagrams.**—To determine the movements of the valve under all conditions of working, various valve diagrams are used; some, like the oval and harmonic diagrams (Figs. 10 and 11), give the exact position of the valve for every position of the crank; others, like the Zeuner and Reuleaux diagrams (Figs. 12 and 13), give, as an approximation, the position the valve would occupy if actuated by an ideal valve gear. In the oval diagram, the position of the valve is plotted vertically, against the position of the piston or crosshead on a horizontal axis. In the harmonic diagram, the positions both of the valve and of the piston are plotted vertically, against the position of the crank (in degrees) on a horizontal axis. Both these diagrams take time to draw out accurately. For more rapid calculations

M and N indicate corresponding positions on the four diagrams, the port openings being shown by thick lines. Each diagram represents one setting of a valve gear; for other settings, with later or earlier cut-offs, or when reversed, separate diagrams must be drawn. These can be superposed on the oval diagram, but must be drawn separately, to avoid confusion, for the other three diagrams. These four diagrams are applicable to slide-valves and piston-valves; for Corliss valves and poppet-valves only harmonic and oval diagrams can be drawn, and they are of very different appearance to Figs. 10 and 11.

**FORMS OF THE STEAM ENGINE.**—The simple steam engine is a single cylinder slow-speed horizontal machine with a slide-valve, using saturated steam and exhausting to the atmosphere. Two or three cylinders give better balance, thus requiring less solid foundations, and a better torque, thus needing a smaller flywheel. Piston- or poppet-valves enable an early cut-off to be used, without throttling, while super-heated steam reduces cylinder condensation. Another type is the vertical high-speed engine with

forced lubrication, and a totally enclosed crank-case to keep out dust and to stop oil being thrown about.

(b) *Condensing Engines*.—A steam engine exhausting to the atmosphere has a high steam consumption on account of the high back pressure (14.7 lb. per sq. in.) (see THERMODYNAMICS). By exhausting into a closed air-tight vessel called a condenser, in which steam is condensed to water almost instantaneously, very low back pressures, down to  $\frac{1}{2}$  lb. per sq. in., can be attained. Condensers are of two types, surface condensers and jet condensers. The former consists of a chamber traversed by a large number of small tubes, through which passes cold water, called circulating water. The exhaust steam is condensed on the outside of these tubes; the condensate thus formed is

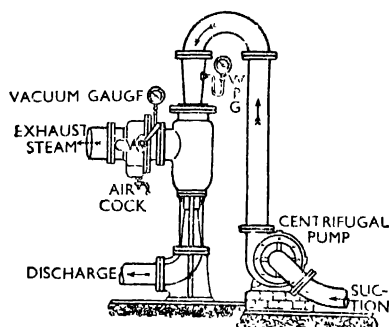


FIG. 11. JET CONDENSER

(V, check valve; W.P.G., water-pressure gauge).

extracted from the bottom of the condenser by an 'air pump' (falsely so called, as its prin. object is to extrac<sup>n</sup> water, though it also deals with any air that may leak in), and, after being freed from oil, is returned to a hot well in the boiler-house to feed the boilers. Being warm, it saves coal; and as it contains no impurities, it does not cause scaling of the boilers as fresh water would; so the condensing engine also reduces boiler troubles. (For further details of surface condensers see TURBINES, STEAM.) In the jet condenser (Fig. 11) the exhaust steam is condensed in a small chamber by direct contact with a jet of cold water; the mixture of condensate and jet water is extracted by means of an 'air pump' and led to the hot well. Jet condensers are more efficient and smaller than surface condensers; but the jet water must be very pure, as any impurities in it are conveyed to the boilers, and deposited as scale; they cannot therefore be used on sea-going ships. Condensers are used on nearly all stationary and marine engines. A good condensing engine (compound), indicating 200 h.p., may require 2200 lb. steam per hr. (or 11 lb. steam per I.H.P.-hr.), whereas an equally good machine exhausting to the atmosphere will need

3800 lb. steam or 19 lb. steam per I.H.P.-hr.).

(c) *Compound Engines*.—The simple steam engine has a high steam consumption due to cylinder condensation (see *Sources of Loss*); this can be overcome either by the use of superheated steam or by reducing the temp. drop in the cylinder during expansion. This is possible without loss due to incomplete expansion by using compound engines; steam is partially expanded in a small high-pressure cylinder, and then passed to a receiver; from here it is admitted to a larger low-pressure cylinder, where the rest of the expansion takes place, finally exhausting to the atmosphere, or a condenser. The range of expansion in each cylinder is thus halved. Engines in which steam is used in three or four stages are called triple or quadruple expansion engines. Typical cylinder ratios (H.P./I.P. or I.P./L.P.) are: compound, 1:2 $\frac{1}{2}$  (non-condensing), or 1:3 $\frac{1}{2}$  (condensing); triple expansion, 1:2 $\frac{1}{2}$ :6 $\frac{1}{2}$  (condensing); quadruple expansion, 1:2:1:8 $\frac{1}{2}$ . Further advantages of the compound system are: (1) later cut-off in each cylinder, thus simplifying the valve gear (see *Valves*); (2) the pressure difference between steam and exhaust in each cylinder being halved, leakage past valve and piston is reduced, (3) the 'missing quantity' in the H.P. cylinder is available for work in the L.P. cylinder before escaping to exhaust. A simple condensing engine, using saturated steam at 180 lb. sq. in. may require 19 lb. steam per I.H.P.-hr., whereas a similar compound will require only 13 lb., and a triple expansion engine 11 lb. This is an extreme case, but even with superheated steam a compound exhausting to the atmosphere will show a saving of 5 to 10 per cent.

(d) *Uniflow Engines*.—In a uniflow engine steam is admitted by valves as usual, but exhaust takes place through ports cut in the cylinder wall; when uncovered by the piston on the outward stroke, release takes place, and when closed again on the return stroke, compression occurs. As these events are inter-dependent, release must be early to avoid excessive compression. In the uniflow engine steam flows only one way—in at the ends via the valves, and out at the middle via the exhaust ports. Live steam does not have to enter through ports that have been cooled by exhaust steam, thus reducing the 'missing quantity,' and wet exhaust steam escapes directly to a cold exhaust port, so that re-evaporation is reduced, giving a free exhaust. Uniflow engines are a comparatively recent development; they are generally fitted with cam-operated drop valves, and are used in mills and collieries where a simple high-efficiency steam engine is required.

USES OF THE STEAM ENGINE. *Stationary*.—The first stationary S. E. were designed for pumping water from mines, to enable them to be sunk much deeper than was possible with hand pumps. The first practical pumping engine was built by Savery in 1698 (Fig. 15); on the down stroke the surface of the water in the

receiver was used as a piston, the water being forced out by the pressure of steam from the boiler, when the steam cock was opened; on the return stroke the steam in the receiver was condensed by pouring water over the outside from the water cock; the resultant vacuum was filled by water from the mine ready for the next down stroke. This engine was very inefficient, as the steam had to heat the receiver at each stroke before it could fill it, resulting in an enormous missing quantity. Further, the height to which water could be pumped was dependent on the boiler pressure, which in those days was very low. Its successor, Newcomen's engine, 1711, used a piston, piston rod, and beam to actuate a separate pump, so that mine water could be forced

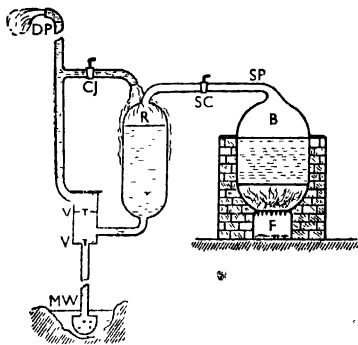


FIG. 13

#### SAVERY'S STATIONARY PUMPING ENGINE

F, fire; B, boiler, SP, steam pipe, SC, steam cock, R, receiver, C.J., condensing jet cock, MW, mine water, V, valves, DP, discharge pipe.

to heights depending on the relative sizes of the steam and water cylinders, without requiring a high steam pressure. The cylinder, however, was still used as a condenser (a jet of water being injected each stroke), which meant a very large steam consumption. The idea of keeping the cylinder hot continuously, by using a separate condenser, was due to Watt, who patented a single-acting engine on this system in 1769, and brought out his first double-acting engine in 1782. Watt made a scientific study of the steam engine, and invented the separate condenser, the 'air-pump,' expansive working of steam, lagging of the cylinder and steam pipes, the stuffing-box, the governor, the indicator, and the parallel motion (of which the modern equivalent is the crosshead and slide bar); the crank was also his invention, but the patent was stolen. The success of his low-pressure condensing engine delayed the coming of the high-pressure non-condensing engine and the compound engine (invented by Hornblower, 1781) for many years. And, as his machines were beam engines, the

direct-acting engine was a rarity until after 1825. With the invention of the crank in 1781, the steam engine came into extensive use for power purposes, and was the only power used during the industrial revolution and until the end of the nineteenth century. S. E. worked the first electric power stations, where the need for high speeds was met by vertical engines (of Bellis & Morcom, and Willans types), and the later demand for large powers by enormous vertical triple and quadruple expansion engines. When alternating-current electric power stations were erected, difficulty was experienced in keeping the alternators 'paralleled,' due to the fluctuation in torque of the steam engine; and a solution was found in the large steam turbine, with its even torque, perfect balance, and great power, overload capacity, speed, and steam economy (see TURBINES, STEAM). S. E. are no longer installed in power stations, and their use has diminished elsewhere, being replaced by: (1) steam turbines where large powers are required for large mill drives or blowing engines for large furnaces; (2) heavy oil or gas engines (which are very economical in small sizes and require no boiler) for small power stations, workshops, and country houses; but chiefly (3) electric motors, supplied with current from a central or local power station. S. E. are still used (1) where steam is needed for process work, as in paper mills, and boilers would have to be installed in any case; (2) for absolute reliability, which the steam engine, with 150 years of development, almost alone can give, as in colliery winding and haulage (though even here electric motors are often used); (3) where the engine is liable to severe abuse, as in steel rolling mills (though electric motors are nowadays designed for this service), in forging (see STEAM AND POWER HAMMERS), and abroad, for use with native labour; (4) small S. E., direct coupled to pumps without connecting rods and cranks, are used for feeding boilers and for pumping chemicals.

**Marine Engines.**—The first practical steamboat was the *Charlotte Dundas*, a tug built by Symington in 1801, and fitted with one of Watt's double-acting condensing engines, driving a stern paddle wheel. The first naval steamship was the *Lightning*, built at Deptford in 1823. All early steamships were fitted with paddle wheels, so that the main shaft was transverse, at a considerable height above the ship's bottom, and rotated at a slow speed. The first marine engine proper (as distinct from a land engine fitted into a ship) was the side lever engine, a variation of the beam engine that was proving so successful on land. The beam or 'lever' was placed at the side of a vertical cylinder, in the bottom of the boat, and was driven by return rods from the crosshead. It was used on merchant ships almost until the advent of the screw propeller in 1840; in the navy, however, direct-acting engines were tried, both of the orthodox type, and with oscillating cylinders placed vertically under the crankshaft, working upwards to



save space, for until 1869 steam in the navy was used only as an auxiliary to sails. Successful experiments with the screw propeller were carried out by Ericsson in 1837, and the first ship so fitted was Brunel's enormous passenger steam *Great Eastern*, 1840; but propellers did not become standard practice in the mercantile marine till about 1860. The propeller did not interfere with the sailing qualities of a ship, and was much less vulnerable than the paddle wheel, so it found great favour in the navy. Marine engine design was thereby completely changed, as the main shaft was now fore-and-aft, low down in the ship, and rotated at a high speed. The first naval vessel with a propeller, the *Rattler* (1843), had oscillating cylinders working downwards, geared to the propeller shaft. This expedient was only temporary, as higher-speed engines, direct coupled to the main shaft, were soon developed. Some difficulty was experienced with them, as they had to be entirely below the water line to avoid damage in action; the vertical marine engine working downwards on to the shaft, as used in merchant ships, could not be employed, and there was very little room in the width of the ship for horizontal engines. The Tennant direct-acting engine, the Maudslay return connecting-rod engine, and the Penn trunk engine were the most successful. With the introduction of armoured ships in 1872 the vertical marine engine was adopted, and this proved the final type both for the navy and the mercantile marine. With the low boiler pressures at first used (10–20 lb. per sq. in.), single expansion engines were adequate, but as pressures rose to 60 and 120 lb. per sq. in., compound engines came into use (1870); with a still further rise in pressure to 150 lb. per sq. in. (1885), and to 300 lb. per sq. in. with water-tube boilers in the navy (1895), triple expansion engines became general. In the merchant service quadruple expansion engines were also developed (1900). The early engines had jet condensers, which introduced salt water into the boilers, causing rapid scaling and corrosion; surface condensers had previously been tried and found unsatisfactory, but in 1860 they were introduced and improved boiler conditions considerably. To-day the use of the steam engine for marine work is declining. For large powers it has been replaced by the steam turbine (see *TURBINES, STEAM*), as in land practice; since 1905 all war vessels for the R.N. have been so equipped, and so have most of the larger liners and many smaller passenger boats; for medium and small powers it is being replaced by the Diesel engine (see *OIL ENGINES*). Marine S. E. are still built, however, for the larger cargo boats, owing to their low initial cost and great reliability; while recent designs with high-pressures, superheated steam, and poppet-valves have reduced the difference in running cost between Diesel and steam. Sev. medium-power vessels also are fitted with compound engines and exhaust steam turbines, thus getting the advantage of the very low condenser pressures

that the steam engine alone cannot utilise properly.

**Locomotive Engines.**—The first locomotives were built to replace horses on colliery tramways and enable a greater output of coal to be handled. The first practical locomotive, built by Trevithick in 1804, performed its work successfully, but was soon abandoned, as its weight broke the iron plates on which it ran. The first adhesion locomotive, running on 'edge' rails, was built by Blackett in 1813 for Wylam colliery, Northumberland, and was soon followed by others in the neighbourhood. (For the hist. of the steam locomotive see *RAILWAYS*.) The modern locomotive is founded on a pair of longitudinal frame plates, braced together by cross stretchers. It is supported (1) on the coupled wheels by springs bearing on the axle boxes in which the coupled axles run, and (2) on the carrying wheels by means of a sub-frame (bogies or pony) which is free to move in order to guide the engine round curves at speed. The boiler (see *BOILERS*) is supported at its ends, being riveted to the smoke-box in front and resting on expansion brackets at the back. Behind it is the footplate, from which the locomotive is operated, covered by a weatherproof cab. The smoke-box is bolted to the frames at the front of the engine, and contains the superheater and steam pipes leading to the cylinders; also the blast pipe through which the exhaust steam escapes up the chimney, creating a powerful draught on the fire. The cylinders are bolted to the frames beneath the smoke-box and drive one pair of coupled wheels (driving wheels) by connecting rods. The drive is taken to the other wheels by coupling rods, and converted into tractive force by friction between the wheels and the rails (approximately  $\frac{1}{4}$  to  $\frac{1}{2}$  of the adhesion or weight carried on the coupled wheels). Steam is admitted to the cylinders by a regulator valve in the boiler, operated from the cab, distribution is by piston-valves and Walschaerts gear, controlled by a reversing screw in the cab. For stopping cast-iron brake blocks are pressed against the treads of the wheels by a steam, air, or vacuum cylinder (according to the braking system employed) operated by a driver's brake-valve in the cab. Water is fed to the boiler by two injectors, one of which is frequently worked by exhaust steam. Coal and water supplies are carried in a six- or eight-wheeled tender attached behind the locomotive. Condensing is not used on locomotives, the theoretical increase in output not being obtained in practice, because a substitute for the blast pipe would have to be found; and, owing to space restrictions, a separate condenser vehicle would have to be provided and hauled; and both these would absorb power. S. E. were used in motor cars from about 1890 to 1914, but are now obsolete on account of their weight and the time required to light up the boiler at starting. S. E. however, are still in use on road rollers (where weight is an advantage), on traction engines, and on heavy road lorries, where simplicity and the use

of cheap coal give them an advantage over petrol lorries. Modern steam wagons are mounted on pneumatic tyres, and are fitted with a high-speed engine embodying poppet-valves and using highly superheated steam.

See Sir J. A. Ewing, *The Steam Engine and other Heat Engines* (4th ed. revised), 1926; H. W. Dickinson and R. Jenkins, *James Watt and the Steam Engine*, 1927; C. S. Darling, *Exhaust Steam Engineering*, 1928; W. E. Dalby, *The Balancing of Engines*, 1929; G. O. McLearn, *Steam Power Stations*, 1932; and R. H. Grundy, *Theory and Practice of Heat Engines*, 1942.

**Steam Navy**, see EXCAVATION.

**Steam Turbine**, see TURBINES.

**Stearic Acid** ( $C_{17}H_{35}COOH$ ), fatty acid occurring in fats and oils. It is, when pure, a colourless waxy substance, insoluble in water, but soluble in alcohol and ether (melting point  $69^{\circ}C.$ ). All its salts, except those of the alkalis, are insoluble in water. On the commercial scale, tallow and other fats and oils are decomposed with water, dilute sulphuric acid, or milk of lime under pressure. The product is distilled in a current of superheated steam and a pasty mixture of fatty acids is obtained, from which all glycerol and liquid oleic acid is removed by pressure. The remaining hard mass is a mixture of palmitic and stearic acids (stearin, *q.v.*), which is mixed with paraffin to make it less brittle and employed in the manufacture of candles. S. A. is also utilised for polishes and rubber compounds, and in ointments as a substitute for wax. Sodium stearate,  $C_{17}H_{35}COONa$ , is the chief constituent of soap (*q.v.*).

**Stearin, Tristearin, or Glycerine Tristearate**, ( $C_{57}H_{113}O_6$ ), is a component of the solid fats, and when pure is a colourless, tasteless substance, soluble in ether but insoluble in water. It is decomposed by water and dilute mineral acids at moderately high temps. ( $200^{\circ}C.$ ), forming glycerol and stearic acid (*q.v.*).

**Steatite, or Soapstone**, see TALC.

**Steatornis**, see GUACTIARO.

**Stedman, Edmund Clarence** (1833–1908), Amer. poet and critic, *b.* at Hartford, Connecticut, and graduated at Yale. He began life as a journalist, was a banker in Wall Street, New York, from 1861 to 1889, and was for over twenty years on the New York stock exchange. His *Victorian Poets* (1875), *Poets of America* (1885), and *Elements of Poetry* (1892) show great clearness of vision and judgment, and gave him a great reputation. Among his poems, the last collection of which was issued in 1897, the more ambitious are *The blameless Prince* (1869) and an *Ode on Hawthorne* (1877).

**Steel, Henry Wickham** (*b.* 1871), Eng. journalist, *b.* at Long Melford, Suffolk, educated at Sudbury Grammar School and at Jena, Berlin, and Paris Univs. In 1896 he became foreign correspondent to *The Times* in Berlin, and from Jan. 1914 and throughout the First World War was foreign editor. From 1918 to 1922 he was editor of *The Times*, and from 1923 to 1931 was proprietor and editor of the *Review of Reviews* (*q.v.*). From 1925 to 1938 he

lectured on European hist. at London Univ. Pubs. include *The Hapsburg Monarchy* (1913, 1918); *Through Thirty Years, 1892–1922* (1924); *The Antecedents of Post-war Europe* (1932); *Hitler: Whence and Whither?* (1934); *The Press* (1938); *The Fifth Arm* (1940); and *Words on the Air* (broadcast talks, 1946).

**Steel**, see IRON AND STEEL; ROLLING MILLS. See also under METALLURGY.

**Steel-bow Lease**, in old Scots law, S. goods comprised corn, straw, cattle, or instruments of tillage delivered by a landlord to the tenant at entry on the condition that at the end of the tenancy a like quantity of such goods would be re-delivered by the tenant. In addition the tenant paid a S. rent of 5 per cent on the value of the stock.

**Steele, Sir Richard** (1672–1729), Irish man of letters, *b.* in Dublin, and educated at the Charterhouse, London, where Addison was a fellow pupil. He entered the Horse Guards in 1694, and in his early years led a care-free and dissipated life. He pub. *The Christian Hero* in 1701, and in 1703 his *Lying Lover* was performed at Drury Lane. In 1709 he founded the *Tatler*, and over the signature of 'Isaac Bickerstaff' contributed two-thirds of the essays, Addison writing sev. of the remainder. In 1711 he started the *Spectator*, and contributed to this many papers, inventing the 'Spectator Club.' He entered Parliament in 1713, and in the following year issued *The Crisis*, in favour of the Hanoverian Succession. After the accession of George I. he was rewarded for his support with various offices. His last comedy, *The Conscious Lovers*, was produced at Drury Lane in 1722. It is, however, rather as the essayist of the *Spectator* and the *Tatler* that he is famous. S., unlike Addison, is not completely a man of his time, some traits recalling the Restoration, others foreshadowing the later eighteenth century; a classicist only by opportunity and accident. With clear thought, and a gift of delicate treatment, he seeks in fact the ideal of a pleasant negligence, and his form is more spontaneous than painstaking. In the *Tatler*, S.'s individual work, he soon turns to a favourite task, the reform of manners, and the victory of culture over excess individualism, in the same way as did the *fr. salons* of the seventeenth century. Both S. and Addison were able to establish a compromise between the moral freedom leading to licentiousness of the Restoration, and the puritanism which the Commonwealth had brought to disfavour. S.'s sentimental comedies have a great charm and finesse, expressing his own beliefs in homely virtues and moralising principles, and adding a gift for comedy and lively dialogue. *The Funeral* is the most amusing; *The Conscious Lovers* appeals to sensibility. See lives and studies by H. R. Montgomery, 1865; A. Dobson, 1888; G. A. Aitken, 1889; and W. Connely, 1934.

**Steel Engraving**, see ENGRAVING.

**Steel, Harveyised**, is steel which has been 'face-hardened' by a process invented by H. A. Harvey, which is chiefly applied

to armour plates. When the plate has been rolled out to the desired size and shape, in steel containing from .10 to .35 per cent of carbon, it is laid flat in a bed of finely powdered clay or sand, upon the bottom of a compartment erected within a furnace. The compartment is then fitted with granular carbonaceous material which is covered with a layer of sand and pressed down on the plate by rows of heavy fire bricks. The furnace is raised to an intense heat, the temp. being kept up for about 120 hrs., by which time the face of the steel has absorbed sufficient carbon to harden it, sometimes as much as 1 per cent being thus taken up. When the surface of the plate has cooled down to a dull cherry-red colour, the superincumbent material is removed and the plate chilled by spraying with torrents of cold water. A plate of steel 10½ in. thick, when treated in the above manner, is found to be supercarbonsated to a depth of about 3 in. Nickel steel when treated by the above process yields a material which is even harder than H. S.

**Steel Yard**, see BALAN E.

**Steen, Jan Havick** (1626-79), Dutch painter, b. at Leyden, studied under Knipfer, Adrian van Ostade, and Jan van Goyen. In 1648 he joined the painters' guild in Haarlem, and later in life kept a tavern at Delft. S. was a painter of great diversity, producing compact scenes of human life with much ingenuity of colouring. His chief pictures are the 'Music Master,' 'Tavern Company,' 'Oyster Girl,' and 'St. Nicholas.' See study by A. Bredius, 1927.

**Steen, Karl**, see DAUDET, JULIA ALLARD.

**Steenbok**, see STEINBOK.

**Steeplechasing**, see HORSE-RACING; POINT TO POINT STEEPLCHASES.

**Steer, Philip Wilson** (1860-1942), Eng. painter, b. at Birkenhead, studied painting at the Gloucester School of Art, in Paris at Julian's under Bouguereau and at the Beaux Arts under Cabanel. His 'Chesham Castle' and 'Mrs. Raynes' both in the Tate Gallery, are perhaps his finest achievements in landscape and portraiture respectively. He first exhibited at the Royal Academy in 1883. In 1885 he was rejected and remained aloof until 1940. He will rank primarily as a landscape artist in the tradition of Constable, with some leaning towards Turner and Gainsborough, with his comparative indifference to the forms of objects and preoccupation with light and atmospheric colour. In 1934 S. was accorded the rare honour, for a living artist, of having an exhibition of his works at the National Gallery. Some critics regard him as the greatest landscape painter since Turner. His Chinese picture, 'The Drunken Sage,' was left to the Brit. Museum. S. was awarded the Order of Merit in 1937. See lives and studies by R. Ironside and J. Rothenstein, 1944, and D. S. MacColl, 1945.

**Stefano, Tommaso di**, see GIOTTINO.

**Stefan's Law**, named from Joseph Stefan, Austrian physicist (1835-93), states that the amount of energy radiated per second from a heated body is propor-

tional to the fourth power of its absolute temp. Thus, if R is the amount of energy radiated from a body at an absolute temp. T, then  $R = ET^4$ , where E is a constant. Strictly the law only applies to 'black bodies' (see RADIATION), but it is frequently a good approximation to the radiation of other objects also.

**Stefansson, Vilhjálmur** (b. 1879), Canadian explorer, b. at Arnes, Manitoba, of Scandinavian ancestry. Graduated at the State Univ. of Iowa, and was also a student at Harvard. S. was one of the leaders of the Anglo-Amer. expedition to the Arctic seas (1905-12), claiming to have discovered a lost European tribe in the neighbourhood of Coronation Gulf, an Eskimo of a very light colour, with blue eyes and red hair. He commanded the Canadian Arctic Expedition, 1913-18, discovering Prince Patrick Land, and journeyed to the centre of Australia (1924). He wrote *My Life with the Eskimo* (1913); *Anthropological Report* (1914); *The Friendly Arctic* (1921); *The Northward Course of Empire* (1922); *The Adventure of Wrangel Island* (1925); *The Standardisation of Error* (1927); *Adventures in Error* (1937); *Three Voyages of Martin Frobisher* (1938); *Unsolved Mysteries of the Arctic* (1938); *Iceland: the First American Republic* (1939); *Ultima Thule: Further Mysteries of the Arctic* (1940); and *Greenland* (1942).

**Steffens, Henrik** (1773-1815), Norwegian philosopher, b. at Stavanger. He studied under Schelling at Jena, and occupied a chair of philosophy and mineralogy at the univ. of Halle. For some years he was rector of the univ. of Berlin. His pubs. include *Anthropology* (1821); *False Theology and True Faith* (1823); and *Christian Philosophy* (1839). See life by V. Wasmuthius, 1939.

**Stegosaurus**, species of dinosaur found in the upper Jurassic beds of N. America. It was about 30 ft. long, had a remarkably small head relatively to its unwieldy body and heavy tail, and its back was armoured with heavy bony plates. Like the Brontosaurus, it was herbivorous.

**Steiermark**, see STYRIA.

**Stein, Charlotte von** (1742-1827), Ger. authoress, b. at Eisenach. After the death of the Baron von S., she became an intimate friend of Goethe. His letters to her have been pub. (1848-51, 1923). She wrote a tragedy called *Dido*. See lives by H. Duntzer, 1874; W. von Bode, 1912; and L. Voss, 1921; and E. Adler, *Goethe and Frau von Stein*, 1887.

**Stein, Gertrude** (1874-1946), Amer. author, b. at Alleghany, Pennsylvania, and educated at Radcliffe College and John Hopkins medical school, where she made a study of brain anatomy. From 1904 she lived in Paris for some years, and in the First World War was decorated for work for the Fr. wounded. In her works, influenced by Picasso and Matisse, she developed an abstract, experimental type of prose which had some influence on later writers. Some of the mannerisms of a conscious innovator were abandoned, with profit to intelligibility, in the later vols. She described her books as fiction

or autobiography or children's literature, but neither her own descriptions nor the oddity of her titles give any real clue to their contents, which, however, show much observation and profundity. Her writings include *Three Lives* (1908); *Making of Americans* (1925); *Autobiography of Alice B. Toklas* (1933), continued in *Everybody's Diary* (1937); a study on Picasso (1938); *Paris France* (1940); and *Wars I have Seen* (1946).

**Stein, Heinrich Friedrich Karl, Freiherr vom und zum** (1757-1831), Ger. statesman, b. near Nassau. He entered the service of Frederick the Great in 1780, and was appointed president of the Westphalian Chambers in 1796. From 1804 to 1807 he acted as minister of state for trade. He was out of office for a time, but after Tilsit was recalled and given a free hand. His reforms included the abolition of serfdom and class distinctions with regard to callings and occupations, the introduction of free trade in land, a reorganisation of the Cabinet system, and the estab. of local self-government in tus. His work was aimed at arousing resistance to the Fr., and Napoleon on this account secured his dismissal. As a political refugee from 1812 to 1815 he was an advisor to the Tsar Alexander I., and later administrated the liberated ters. At the Congress of Vienna S. pressed for a united Germany with a constitution excluding the princes, but was successfully opposed by Metternich. He then retired, studied hist., and founded (1819) an historical research society, which pub. *Monumenta Germaniae historica*. See lives and studies by J. R. Seeley, 1879; M. Lehmann, 1902-5, 1928; K. Thiede, 1927; G. Ritter, 1927-31; Ricarda Huch (2nd ed.), 1932; C. de Grunwald, 1936; and G. Siegrist, 1940.

**Stein, Sir Marc Aurel** (1862-1943), Brit. archaeologist and Asiatic scholar, b. in Budapest. He travelled widely in Kashmir, central Asia (conducting excavations in Khotan), W. China (see CAVES OF A THOUSAND BUDDHAS), Persia, Iraq, and Transjordan. His pubs. include *Chronicle of Kings of Kashmir* (1900); *Ancient Khotan* (1907); *Ruins of Desert Cathay* (1912); *Serindia* (1921); *The Thousand Buddhas* (1921); *On Alexander's Track to the Indus* (1929); *The Archaeological Tour in Waziristan and N. Baluchistan* (1931); *Archaeological Reconnaissances in S.E. Iran* (1937); and *On Old Routes of Western Iran* (1940).

**Steinamangar**, see SZOMBATHELY.

**Steinbeck, John Ernst** (b. 1902), Amer. novelist and short-story writer, b. at Salinas, California, and educated at Stanford Univ. He first won attention with the appearance in 1935 of the ironically humorous *Tortilla Flat*, a novel of life among the paisanos of Monterey, California. His reputation grew steadily with the pub. of the novels *Of Mice and Men* (1937; dramatised 1939, and filmed 1940) and, especially, *The Grapes of Wrath* (1939; filmed in 1940). This latter novel, which won the Pulitzer prize for 1940, is the story of a refugee family from the dust-bowl of America, and is considered to be among the foremost works

of modern realistic fiction. Mostly his books are a blend of realism and romance, and their background and atmosphere are generally rural. Other books: *Cup of Gold* (1929); *Pastures of Heaven* (1932); *To a God Unknown* (1933); *The Moon is Down* (1942); *Cannery Row* (1945); *The Wayward Bus* (1947); *The Pearl* (1947, Mexican folk-legends). See studies by H. T. Moore, 1939, and J. H. Jackson, 1940.

**Steinbok, or Steenbok**, S. African antelopes of the genus *Nanotragus*. *N. tragulus*, the common S., is reddish-brown above, white below, while *N. melanotis* is of a greyish colour; *N. pygmaeus*, which stands 10 in. high, is the smallest living ruminant.

**Steiner, Rudolf** (1861-1925), Austrian founder of anthroposophy, b. in Kraljevic in Croatia, studied mathematics and natural science, and later worked in the Goethe archives at Weimar. From 1902 he evolved a new study of the higher worlds opposed to traditional occultism. He worked in many spheres of learning and his theories of education, using the arts therapeutically in the treatment of mental deficiency, had much influence, his pioneer school at Stuttgart (estab. 1919) inspiring similar experiments in many countries, including Britain. His works include *Welt- und Lebensanschauungen des neunzehnten Jahrhunderts* (1900-1); *Theosophie* (1904); *Wie erlangt man Erkenntnisse der höheren Welte* (1909); and an autobiography, *Mein Lebensgang* (1925). See lives and studies by F. Rittelmeyer (2nd ed.), 1928; F. Poeppig, 1938; and G. Wachsmuth, 1941.

**Steinmetz, Charles Proteus** (1865-1923), Ger.-Amer. electrical engineer, b. at Breslau, and educated at the univs. of Breslau, Berlin, and Zürich, where he specialised in chem. and electrical engineering. In 1889 he emigrated to the U.S.A., and eventually became consulting engineer to the great General Electric Company at Schenectady, New York. He devoted much time to the study of the phenomena of lighting and alternating electric current, and made studies of the loss of power in electric currents of all kinds. He held many patents for improvements, and new devices in electric generators and motors.

**Steir**, see STEYER.

**Stekene**, tu. in the prov. of W. Flanders, Belgium, 15 m. W. of Antwerp. It has manufs. of pottery, hats, carpets, sabots, and has brick-kilns. Pop. 8700.

**Stella**, see SIDNEY, SIR PHILIP; RICH, PENELOPE; and SWIFT, JONATHAN.

**Stellaland**, one of two republics (the other being Goshen or Goosen), which the Boers from the Transvaal set up in 1882 on land which had been given them by native chiefs in return for help rendered in inter-tribal wars, especially those in which Chaka was involved. It was so named on account of the fact that the great comet of 1882 was visible at the time of its formation. It had its cap. at Vryburg. The estab. of these states did not, however, end inter-tribal disturbances, with the result that these and other neighbouring ters. were declared a Brit. protectorate in

1884. The two republics were dissolved without bloodshed following Sir Charles Warren's arrival in Bechuanaland. See W. Williams, *Life of Sir C. Warren*, 1941, and S. Cloete, *African Portraits*, 1946.

**Stellaria**, or **Stichwort**, genus of Alismacae (a sub-order of clovewort), named S. because the corona is stellate or radiated. There are upwards of seventy known species of these herbs from temperate to cold climates. Brit. species are *S. aquatica*, water; *S. memorum*, wood; *S. media*, the common, also called common chickweed; *S. Holostea*, the Greater; *S. glauca*, the glaucous marsh; *S. graminea*, the Lesser; and *S. uliginosa*, the bog stitchwort. *S. Holostea* is from 1 to 2 ft. high, and has large white flowers; it is common in copses and hedgerows, and is often planted in gardens as a border flower.

**Stellar Magnitudes**, see under STARS.

**Stellar Parallax**, see under PARALLAX.

**Stellenbosch**, tn. of Cape Prov., S. Africa, 31 m. E. of Cape Town, situated in a vine-growing valley, W. of the Drakenstein Mts. The second oldest tn. in South Africa, the site of S. was selected by Simon van der Stell, one of the earliest and most progressive governors of the cape. Oak-trees are a feature of the streets. S. has a picturesque Rhenish church, which stands in the *brak* or vil. square, with a fine pulpit carved by Anton Anreith. There is a granite memorial to Johannes du Plessis, the famous mission secretary of the Dutch Reformed Church, who became prof. at the theological seminary at S. At S. is a noted univ., with some 2000 students, until 1918 Victoria College; here were educated James Barry Hertzog and Jan Christian Smuts, both Prime Ministers of South Africa. In the dist. are fruit farms and vineyards, and tin deposits in the streams. Pop. 11,500 (European 7500; coloured, etc., 4000).

**Stelvio Pass** (Ger. *Stilfserjoch*), It. Alpine pass, leads from Bormio, in 'o Valtellina, to Vintschgau, in Tyrol (30 m.), and is the highest carriage road in the Alps (9055 ft.).

**Stem**, usually ascending leaf-bearing portion of a plant, though many S. extend underground, but their apex is never covered by a sheath as are the roots, but by rudimentary leaves. S. act as support for the leaves and flowers and for the conveyance of food materials. In their early growth they are usually green, soft, and herbaceous, but later they may become dark coloured and hard and woody, persisting from year to year. Herbaceous perennials which die down each autumn have persistent underground S. or branches, which differ from roots by their small scale leaves, e.g. the rhizomes of the Iris, Solomon's seal; the soboles of the lily-of-the-valley and couch-grass; other underground S. are the tuber, bulb, corm. Above ground S. may be erect, ascending, prostrate, creeping, climbing, or twining. The zone of the S. from which the leaves spring is the node.

**Stemonaceae**, see ROXBURGHIAEAE.

**Sten Carbine**, see under SUB-MACHINE GUNS.

**Stendal**, tn. of Saxony-Anhalt, Germany, on the Uchte, 33 m. N.N.E. of Magdeburg. Among its buildings are the cathedral, begun in 1188 and reconstructed in the fourteenth century, and the Gothic church of St. Mary. It is the bp. of Winckelmann (1717-68), and was the cap. of the old Brandenburg mark. There are metal industries, breweries, and manufs. of preserves. Pop. 30,000.

**Stendhal**, see BEYLE, MARIE HENRI.

**Sten Gun**, see under SUB-MACHINE GUNS.

**Stenness**, Orkney mainland, Scotland, is the site of well-known prehistoric field antiquities. The ring of Brodgar, a stone circle 340 ft. in diameter, is the largest in Scotland. Maes Howe, a fine chambered tomb with dry stone walling, is allied to the Boyne megalithic culture of Ireland. Both are protected as aet. monuments.

**Stenography** and **Stenophonography**, see SHORTHAND.

**Stentor**, Gk. herald, who, according to Homer, shouted before the walls of Troy with the voice of fifty men, whence the adjective *stentorian* is derived.

**Stenval, Alexis**, see KIVI.

**Stepanakert**, cap. of the Nagorno-Karabakh Autonomous Region of the Azerbaijan S.S.R., 60 m. S.S.E. of Kirovabad.

**Stephanome**, instrument for measuring haloes and allied atmospheric phenomena. A graduated bar, the divs. of which are arranged to give at once angular measure, carries a slide with fixed points. A sight being taken from the end of the bar, the slide is moved till its points coincide with the points of the halo to be measured, and the diameter is read off. It was devised by Prof. P. G. Tait for use in the observatory on Ben Nevis, Scotland.

**Stephanotis**, climbing evergreen hot-house plant with white wax fragrant flowers, also known as Madagascar jasmine and clustered wax flower. *S. floribunda* is cultivated in Brit. greenhouses. The variety *Elaeagni* is a dwarf herb and more free-flowering.

**Stephen** (d. A.D. 33), first Christian martyr, a Jew of Gk. culture, one of the seven deacons set apart to minister to the Christian community in Jerusalem. He was charged with preaching 'against the Temple and the Law,' and made a defence of his belief and conduct before the Sanhedrin, but was stoned by the angry crowd. St. Paul, who had taken part, was converted by S.'s dying prayer. Aug. 3 is commemorated as the discovery of the reputed relics of St. S. at Kafr Gamala in 415, and May 7 as the date of their translation to Rome. His festival is celebrated on Dec. 26. See Acts vi. and vii.

**Stephen** (c. 1097-1154), king of England, son of S., count of Blois, and Adela, daughter of William I. He promised to recognise the claims of Matilda, daughter of Henry I., to the Eng. throne but on Henry's death usurped the crown (1155), his brother Henry, bishop of Winchester, being one of his leading supporters. Though a man of some culture, and a good soldier, S. entirely lacked diplomatic tact: as a result of this his reign was marked by civil war of an intermittent character.

In spite of early concessions he made to the church S. lost eccles. support by his ill-judged attack on the Salisbury family (see under ROGER OF SALISBURY). When his son Eustace predeceased him S. abandoned his attempt to found a new dynasty in England: at the treaty of Wallingford (1153) he agreed that Henry, Matilda's son, should succeed him. His reign illustrates the immense power exercised by the church, which, between 1135 and 1153, virtually played the role of king-maker. See W. Stubbs, *Select Charters from the beginning to 1307*, 1870; J. H. Round, *Geoffrey de Mandeville: a Study of the Anarchy*, 1892; and F. M. Stenton, *English Feudalism, 1066-1166*, 1932.

**Stephen**, name of ten (including one unconsecrated) popes of the Rom. Catholic Church, the chief being:

**Stephen I. (Saint)** (254-57), who engaged in a prolonged controversy with Cyprian bishops on the question of rebaptising heretics. In 257 an edict of the Emperor Valerian attacked the church organisation and ordered official adherence to the gods of Rome. S. was driven into exile.

**Stephen III.** (752-57), who sought the aid of Pippin against Aistulf, king of Lombardy, and by so doing secured for Rome the exarchate of Ravenna. He was a man of weak character, the instrument of every party in turn.

**Stephen X., Friedrich von Lothringen** (1057-58), who was a staunch supporter of clerical celibacy and much under the influence of Hildebrand.

**Stephen** (kings of Hungary):

**Stephen I., or St. Stephen** (c. 966-1038), b. of Christian parents and brought up on the Scriptures. Soon after the death of his father (997) Geza, duke of Hungary, he defeated some pagan rebels on his ter. at Veszprem (998), and henceforth assumed the title of king, which was confirmed by Pope Sylvester II. in 1001. Throughout his reign he endeavoured to establish Christianity in his kingdom by force of arms. He defeated the invading army of the Emperor Conrad in 1030. S. was canonised in 1083, and is regarded as the greatest Magyar hero and national saint. See B. Homan, *König Stephan I., Die Gründung des ungarischen Staates*, 1941.

**Stephen I.** (1262-72), son of Béla IV., was born in 1239. In 1262 he obtained the rule of half Hungary from his father, and extended his dominions into Bulgaria. In 1271 he defeated Ottakar II. of Bohemia near Mosony.

**Stephen Bathori** (king of Poland), see BATHORI, and POLAND, *History*.

**Stephen**, George, see MOUNTSTEPHEN, BARON.

**Stephen Harding, Saint** (d 1137), Eng. monk of Sherborne. He became abbot of Cîteaux in 1109, and drew up the original constitutions of the Cistercians, and the charter of charity presented to the general chapter of Cîteaux in 1119.

**Stephen, Sir Leslie** (1832-1904), Eng. man of letters, b. in London, educated at King's College, London, and Trinity Hall, Cambridge. At the univ. he distinguished himself at the Union and also as an athlete. He was a devoted Alpinist and

wrote on mt.-climbing, and collected his papers as *The Playground of Europe* (1871, 1895). He took orders in 1855, but seven years later found himself unable to accept Christianity, and resigned his tutorship at Cambridge. He worked in London for the *Saturday Review* and the *Pall Mall Gazette*, and in 1866 began to contribute to the *Cornhill Magazine* (of which from 1871 to 1882 he was editor) the essays known as *Hours in a Library* (1874-79). Of his writings on religion his best book is *An Agnostic's Apology* (1893). Among his other works are a *History of English Thought in the Eighteenth Century* (1876), and lives of Johnson, Pope, Swift, George Eliot, and Hobbes. He was editor of the *Dictionary of National Biography* (1886-91). He was knighted in 1902. Virginia Woolf (*q.v.*) was a daughter of S. See life and letters by F. W. Maitland, 1886, and study by D. MacCarthy, 1937.

**Stephen of Grandmont, Saint** (1046-1184), b. at Thiers in Auvergne. Though not himself a monk, he founded the Grandmontine branch of the Benedictine order. He was canonised in 1189 at the request of Henry II. of England.

**Stephens** (Fr. *Estienne, Étienne*; Lat. *Stephanus*), Fr. family of scholars, printers, and publishers, the founder being Henry S. (c. 1465-1520), who started a business in Paris about 1500. For a time his foreman, Simon de Colines, who married Henry's widow, took over the estab., which was afterwards managed by Henry's second son Robert (1503-59). Robert came under the influence of the Reformation, and aroused the anger of the univ. of Paris by his pub. of the *Novum Testamentum* (1522) and of the Lat. Bible (1540). He himself wrote a *Dictionarium seu Latinæ Linguae Thesaurus* (1532), and was printer to the king for Lat. and Heb. works. In all Robert printed eleven eds. of the Bible, in Lat., Heb., and Fr., and twelve of the N.T. in Gk., Lat., and Fr. The opposition of the theologians forced him to leave Paris for Geneva, where his son Henry (1531-98) joined him in 1551. The latter was one of the greatest scholars of his time and pub. first eds. of some twenty Gk. authors and compiled *Thesaurus Graecæ Linguae* (5 vols., 1572). Robert's brothers, Francis (1502-50) and Charles (1504-64), were also engaged in the business. See M. Maittaire, *Stephanorum Historia*, 1709; W. P. Creswell, *A View of the Early Parisian Greek Press*, 1833; and A. A. Renouard, *Annales de l'imprimerie des Étienne*, 1837.

**Stephens, James** (b. 1882), Irish poet and novelist, b. in Dublin. Irish nationalist in sympathy, his work combines realism with Celtic myth and legend. His original fairy stories, *The Crock of Gold*, were pub. in 1912, and his collection of *Irish Fairy Tales* in 1923. Collected eds. of his poems were pub. in 1926 and 1931. Among his other works are *The Charwoman's Daughter* (1912); *The Hill of Vision* (1912); *Deirdre* (1923); *In the Land of Youth* (1924); *Riched in Moonlight* (1928); and *Kings and the Moon* (1938).

**Stephens, James Brunton** (1835-1902), Australian poet, b. at Borrowstounness,

W. Lothian, Scotland, went to Queensland in 1866. His one long poem, *Convict Once* (1871), with its dignified language and imaginative quality, occupies a high place in scholarly verse of Australia; he achieved popularity by purely farcical verse, but his best work is in the Children's Hospital poems, and in two patriotic poems on Australia written in 1877 and 1900, the first being specially notable in this type of verse. His collected work was pub. in 1885 and 1902, and selections in 1925.

**Stephenson, George** (1781-1848), *b.* at Newcastle-upon-Tyne, for many years worked in various mines as an engineer. In 1815 he, simultaneously with Sir Humphry Davy, invented a safety-lamp. He designed a locomotive (which he called 'My Lord'), which was successfully tried on the tramroads of the Killingworth Colliery, in 1814. The projectors of the Stockton and Darlington Railway appointed him their engineer (1822), and the Stockton and Darlington, the first railway on which passengers and goods were carried by a locomotive, was opened on Sept. 27, 1825. The success of this venture led to the employment of S. in the construction of the Liverpool and Manchester Railway, which he carried successfully through Chat Moss. It was on this line that his improved invention, the 'Rocket,' made its trial trip at 29 m.p.h. Henceforth until his death he was employed as a designer of railways, and during these years greatly improved upon his early locomotive. His work was of the greatest importance in railway development. See life by S. Smiles, 1864.

**Stephenson, Robert** (1803-59), Eng. engineer, *b.* near Newcastle-upon-Tyne, son of the above. He travelled in S. America, and returning to England in 1827 took part in the construction of his father's 'Rocket,' and in the laying of the first railways in the country. In 1837 he became chief engineer on the Birmingham Railway. He was one of the greatest railway engineering experts of his time, and specialised in the construction of railway bridges. He was M.P. for Whitby (1847-48).

**Stepney**, metropolitan bor. in the E. of London, England, 2 m. from St. Paul's. It is a suffragan bishopric, and includes Spitalfields, Mile End, Whitechapel, Ratcliff, Wapping, Limehouse, Shadwell, and St. George's in the E. It returns one member to Parliament. Pop. 100,000.

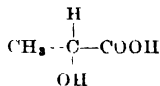
**Stepniak, Sergei Mikhailovich**, whose real name was Kravchinski (1852-95), Russian revolutionary, and writer, *b.* in S. Russia of aristocratic descent. In the early seventies he became connected with a group of Nihilists in St. Petersburg, and was arrested for revolutionary propaganda in 1874. He lived later in Switzerland and England. His pubs. include *Underground Russia* (1882); *The Russian Storm Cloud* (1886); and *The Career of a Nihilist* (1889).

**Stepnoi, Elista, or Yelista**, tn. in the Rostov Region of the R.S.F.S.R., near the R. Sal, 150 m. S.S.W. of Stalingrad.

**Steppe** (from Russian *stepi*, a waste),

term applied particularly to the grasslands of S. Russia, and generally to any similar areas in temperate zones, where light rainfall, confined to spring and early summer, produces grassland with few trees, usually in continental interiors. The soil is deep and often rich in humus content, as in the 'black earth' areas of the Ukraine (*q.v.*), though the S. of Siberia (*q.v.*) is less fertile. Grain is a prin. crop, and wild flowers, usually bulbs, abound. See also PAMPAS and PRAIRIE.

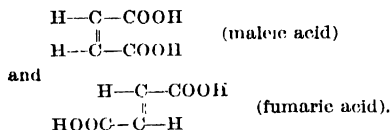
**Stereochemistry** (*i.e.* space-chemistry), concerned with the spatial relations of the atoms in the molecule. Pasteur (1850) obtained crystals of sodium ammonium racemate, and found two classes of crystals, the one containing dextro-hemihedral faces and the other levo-hemihedral faces, *i.e.* the one class of crystals was related to the other as an object to its mirror-image. Solutions of the crystals rotated polarised light to the right and left respectively, *i.e.* dextro- and levo-rotatory. Pasteur's theory regarding these substances was developed independently by Le Bel and van't Hoff (1874). They concluded that a substance is optically active only when its molecule is asymmetric, the most common form of asymmetry being shown by a molecule that contains at least one carbon atom which is directly united with four different groups. One of the simplest of such optically active compounds is lactic acid, which contains an asymmetric carbon atom:



Van't Hoff suggested that the carbon atom was situated at the centre of a regular tetrahedron and the four groups in combination at the four solid angles. The conclusions to be drawn are: (1) A compound of the type  $\text{CH}_3\text{X}$  (where R and X represent any group) can exist in only one form. (2) A compound of the type  $\text{CH}_2\text{XY}$  can exist in only one form (two groups are identical). (3) Compounds of the type  $\text{CRXYZ}$  (carbon atom asymmetric) exist in two different forms, *i.e.* there are two optical or stereochemical isomers or enantiomorphs. More generally, any substance the molecules of which are asymmetric (whether they contain carbon or not) can exist in three forms, *viz.* a dextro-rotatory form, a levo-rotatory to the same extent, and an optically inactive form, consisting of a mixture or loose compound of equal weights of the dextro- and levo-enantiomorphs. This inactive form is said to be 'externally compensated' or 'racemic.' Unless very special methods are followed, synthesis of a substance with asymmetric molecules always yields the externally compensated mixture, and the process of separating this into the two optical enantiomorphs is called 'resolution.' Resolution is difficult since the *d* and *l* forms have identical chemical properties, solubilities, boiling- and melting-points, etc., but can be

effected by forming derivatives with an optically active substance yielding two products no longer identical in solubility, etc.; these can be separated by fractional crystallisation, etc. Thus to resolve an externally compensated acid, salts may be formed with the *l*-avo-rotary base brucine. Then the *d*-acid salt with *l*-brucine is not the optical isomer of the *l*-acid salt with *l*-brucine (for that isomer would be *l*-acid salt with *d*-brucine), and hence the two salts may be separated by taking advantage of their different solubilities in a suitable solvent.

Other forms of stereoisomerism may not involve optical activity, which, as we have seen, is dependent on asymmetry of the molecule. Thus fumaric acid and maleic acid are stereoisomers, but are not optically active since their molecules are symmetrical. The spatial arrangements of these two acids are:



See A. W. Stewart, *Stereochemistry*, 1907; A. Hantzsch, *Elements of Stereochemistry*, 1908; J. Read, *Textbook of Organic Chemistry*, 1926; and P. Karrer, *Organic Chemistry*, 1947.

**Stereo-comparator**, instrument specially devised by Dr. Max Wolf (1901) for detecting any stellar change in a particular portion of the heavens. It depends on the principles of stereoscopic vision. A photograph of the stellar region is taken, and another of a different epoch. When viewed stereoscopically any displacement of a star, any new or missing star, or any difference in brightness is betrayed by the attempt of the muscles of the eye to adjust vision to the normal expected.

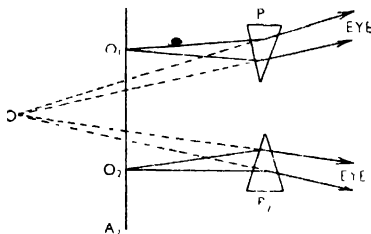
**Stereographic Projection**, see under PROJECTION.

**Stereoisomerism**, see STEREOCHEMISTRY.

**Stereophotogrammetry**, science of mapping and surveying by means of stereoscopic pairs of photographs. The science owes its inception to Aimé Laussedat, who constructed a measuring camera fitted with level and compass. This had horizontal and vertical reference marks for locating a point where the optical axis of the lens met the sensitized plate. An advance of the greatest importance was made in 1898 by Theodore Scheimpfing. Two cameras were fixed to a table to photograph a relief model of a landscape. The developed negatives were replaced in the cameras, each being illuminated from behind so that the rays of light followed the same paths out of the cameras as they had followed on entering. With the aid of an intercepting screen two projected pictures could be viewed, which overlay and cut through one another, only those points coinciding which represented the section of the object formed by the plane of the screen. Sections were thus easily drawn corresponding with the sev-

positions of the screen, allowing the preparation of plans showing contour lines. This experiment forms the basis of modern S. The idea was advanced another stage by the introduction of a binocular system containing a fixed reference mark which appeared to float in the relief model of the landscape as viewed through the binoculars, and could be brought into coincidence with the point of the object to be measured. In modern apparatus pairs of air photographs are set up in the precise positions they occupy at the moment of photography. These are observed stereoscopically through a binocular system, and a three-dimensional view of the landscape is obtained from which maps may be constructed on scales up to 1:1000 with contours at 5 ft. vertical intervals.

**Stereoscope**, optical instrument invented by Wheatstone, which has the effect of giving to ordinary photographic pictures the appearance of solidity. In the instrument now in use two photographs of the same object are taken in the positions in which the person's two eyes would be if he were observing the object from the position in which the camera is placed. These photographs are mounted on a card side by side and viewed through separate acute-angled prisms. The diagram shows an ordinary S.  $A_1$  and  $A_2$  are



PRINCIPLE OF STEREOSCOPE

the two photographs mounted side by side,  $P_1$  and  $P_2$  the two prisms, their angles facing inwards.  $O_1$  and  $O_2$  are the two corresponding parts of the picture. The rays from  $O_1$  fall on the prism  $P_1$  and are refracted, and hence appear to come from  $O_1$ , similarly those from  $O_2$  appear through  $P_2$  to come from  $O_2$  and thus at  $O$  a vertical image is formed; the two vertical images formed by  $P_2$  and  $P_1$  coinciding. Similarly the vertical images of other parts will coincide, and thus instead of two pictures only one is seen and the impression produced on the observer is exactly the same as if he viewed the object itself directly; the front parts of the object appearing to stand out and the back parts to fall back. Stereoscopic photographs are of great value in aerial reconnaissance to counteract camouflage.

Stereoscopic films are the latest development in cinematography, a leading worker in the field being Semen Ivanov, who used a grille of copper wires to split the images thrown by two projectors; later he intro-



duced a screen of optical lenses to split the rays of light. An alternative method, used in America, depends upon the wearing of special spectacles by the audience. Stereoscopy is also applicable to television.

**Stereotyping** (Gk. *στερεός* = solid), process in printing for making metal plates when long runs or frequent reprints are required. The plate is made from a papier mâché mould or facsimile of the type or printing blocks. The mould is made up of sev. sheets of tissue paper pasted together and kept under a weight, to retain the moisture, until required for use. The product is called a flong and is laid on the face of the type and beaten in with a brush to obtain a deep impression. The hollows on the back of the mould are filled in with pieces of straw-board or other material, and the type, with the flong attached, placed on a steam chest, under pressure, to dry. The dried flong is then inserted in the casting-box with gauges of the required thickness for the plate to be used. The Eng. practice is to make the plates 12 point thick. The Amer. plates are 10 point. The metal is then poured into the casting box. The plate when set is taken out, planed, and finished ready for the printing machine. The flong can be preserved for further castings. A moulding press, electrically heated, is a modern substitute for hand beating. 'dry' prefabricated flongs are used. For newspaper work the flong is inserted in a curved casting box to produce a curved plate for the rotary press. By the use of a facing paste on the flong, stereotype plates can be made from half-tone illustrations and then the plates nickel faced after casting.

**Sterilisation**, destruction of bacteria, is important in medicine, since bacteria are the cause of sepsis and many diseases; it is also used in the preservation of food, whose decomposition is due to the activity of saprophytic bacteria and mould fungi. In medicine S. of dressings is effected by superheated steam in an autoclave (an apparatus similar to a pressure cooker); instruments are sterilised by the same means or by the use of antiseptic solutions. The destruction of bacteria inside the body is more difficult, since the available agents are liable to cause the death of the patient as well as the germs; salvarsan, an organic arsenic compound, was introduced by Ehrlich in 1907 in the treatment of syphilis, whose causative organism is a spirochaete closely related to bacteria; the sulphonamides (q.v.) followed in 1935, and the antibiotics such as penicillin (q.v.), chloromycetin (chloramphenicol), and aureomycin, during and following the Second World War. The methods of preserving (q.v.) food include the use of heat with subsequent canning or bottling; antiseptic chemicals such as sulphur dioxide, boracic acid, and formalin (the two latter prohibited by law); pickling in brine, vinegar, or syrup. Refrigeration of food retards the activity of bacteria, but does not destroy them.

**Sterility**, condition of not being capable of reproduction. There are many cases of S. in women: sexual intercourse may be

difficult or unsatisfactory (dyspareunia) from physical or psychological causes; the Fallopian (egg) tubes may be blocked; abnormal growths in the uterus, failure of ovulation, deficiency of sex hormones, and general ill health may also cause S. The investigation of S. calls for a complete pelvic examination of the woman, and a microscopic examination of her husband's seminal fluid (which may be deficient in up to 50 per cent of cases of S.). S. can be artificially induced for medical reasons by ligation of the Fallopian tubes in women, or of the vasa deferentia (sperm tubes) in men. In law S. does not affect the marriage bond, although impotence (q.v.) renders a marriage void. *See also* INSEMINATION, ARTIFICIAL.

**Sterling, Antoinette** (Mrs. J. Mackinlay) (1850-1904), Amer. contralto ballad singer, studied singing under the Garcias and Mme Marchesi.

**Sterling** (O.E. *steorra*, star, some of the early Norman coins being marked with a small star; the derivation from East-England is no longer accepted), term applied to all lawful coins of the realm. Weight and fineness determine the *standard* of coins, and only coin of the true standard is called S. Formerly all coin had, by the provisions of an Act of 1352, to be of S. metal, but the crown varied the standard even before that Act was repealed. By the Coinage Act, 1870, the standard weight and fineness was fixed as follows: (1) for gold coin,  $\frac{1}{12}$  fine gold,  $\frac{1}{12}$  alloy, or millimal fineness 916.66; (2) for silver,  $\frac{1}{12}$  fine silver,  $\frac{1}{12}$  alloy, or millimal fineness 925; (3) for bronze, mixed metal, copper, tin, and zinc. 240 troy oz. of standard gold are coined into 934 sovereigns and one half-sovereign; one troy oz. is therefore worth £3 17s. 10 $\frac{1}{2}$ d., one oz. of pure gold on the same basis being worth £1 4s. 11 $\frac{1}{2}$ d. At the outbreak of the First World War, the gold standard was suspended (i.e. no new gold coins were issued and the Bank of England was no longer obliged to redeem its banknotes in gold). In 1925 the pound S. was brought back to its old parity and the Bank of England was obliged by the Gold Standard Act, 1925, to sell gold at the old fixed price (corresponding to the standard weight of coin, see above) in the form of bars, but banknotes remained unredemable into gold. The obligation to sell gold in bars was suspended on Sept. 21, 1931, and has not been restored since.

**Sterling Area.**—From the confusion that attended the collapse of the international gold standard between the world wars, there emerged a wide area of exchange stability known as the S. area. Its boundaries were not formally defined, but there were two main characteristics by which countries belonging to it might be identified (i.e. these countries maintained their currencies in a fixed relationship with the pound S., and they tended to keep their exchange reserves largely if not wholly in the form of S. balances and other liquid assets in London. The system was not new, for in fact many countries nominally on gold had long been in practice 'on sterling' in the sense above

indicated. When the pound depreciated in Sept. 1931 a group of countries decided from the outset to keep their exchanges stable in terms of S. rather than of gold. This group comprised in the first instance the Brit. Commonwealth, with the important exception of Canada, whose currency took a middle course between the pound and the U.S. dollar. A few non-Brit. countries, such as Portugal, also joined the S. group immediately. Others joined it later, e.g. the Scandinavian countries in 1933, Persia and Latvia in 1936. In addition there were sev. countries, including the Argentine and Japan, which for many years kept their official exchange rates fixed in S., but which were not generally recognised as members of the S. bloc.

In the autumn of 1939, most of the non-Brit. member countries gave up their link with the pound and the S. area became largely co-extensive with the Brit. Commonwealth, again with the exception of Canada. All members applied similar methods of exchange control, which transformed the S. area into a more coherent organisation though its mechanism remained informal. The other main change brought about by the war was that all members of the S. area 'pooled' their dollar resources with the Bank of England, and drew from this common 'pool' their vital dollar requirements. A number of members increased their S. balances during the war (as did non-member countries) and for some countries, e.g., India, these balances were immobilised and releases were fixed annually by mutual agreement in recent years.

The dollar 'pool' was continued after the war, though some members (especially Africa for its gold production) do not pay all their dollar receipts into the pool. The uniformity of the principles of exchange control permits complete freedom of restrictions for payments on current account between its members; capital payments are also permitted in most instances without restrictions. The cohesion of the S. area was demonstrated again in Sept. 1949, when all members followed Britain's lead in devaluation by 30.5 per cent. Pakistan alone maintained the old parity for its rupee, which shows that there is complete freedom for the members of the S. area whether to conform or go their own way.

The present members (1950) of the S. area are all the member-countries of the commonwealth, with the exception of Canada, and, outside the commonwealth, Burma, Iceland, Iraq, and the Irish Republic. The S. area is the world's largest single area of multilateral trade. It comprises about one-fourth of the world's pop. and in 1948 did roughly 27 per cent of world trade.

**Sterling**, of Illinois, U.S.A., 109 m. W. of Chicago. It has iron works. Pop. 11,300.

**Sterkfontein**, Transvaal, S. Africa, site of the discovery in 1949 of a fossil creature who is thought by some authorities to stand in the direct line of descent between ape and man, and very close to man. See *under* MAN.

**Stern, Daniel**, see AGOULT.

**Sterne, Laurence** (1713-68), Brit. humorist, b. at Clonmel, Tipperary, and educated at Jesus College, Cambridge, took holy orders and became vicar of Sutton-in-the-Forest in 1736, and prebendary of York in 1738. In 1760 he was appointed also perpetual curate of Coxwold, and he called his house there 'Shandy Hall.' He wrote sev. miscellaneous pieces from 1741 onwards. *Tristram Shandy* was pub. between 1760 and 1767. He made tours in France and Italy (1762-64), being delicate in health. A second novel, *A Sentimental Journey* (1768) was pub. shortly before his death. He collected and issued his sermons in sev. vols. He had a love affair with Mrs. 'Eliza' Draper, and his *Letters from*



LAURENCE STERNE

*York to Eliza* were pub. in 1773. With S. is reached the extreme limit of the sentimental novel, but he possesses a mastery of emotion, his humour implying great self-possession and detachment. S. did not possess any outstanding gifts for characterisation, and there is an interrelation between all the types he creates. The animality in human nature is almost an obsession with him, so that all his work is coloured with intellectual cynicism and a refined brutality. His art developed with time into a perfect sureness of touch; the *Sentimental Journey* is much more concentrated than the tangled mass of narrative and reflection and digression which constitutes *Tristram Shandy*, and in fine shades and finished polish the former remains unsurpassed. He shows that the novel is to be an autonomous form of art, and the dominant branch of literature.

The *Complete Works* were first pub. in 1773 and 1774; subsequent eds. are those of G. Saintsbury (1894); W. L. Cross (1906); and the Shakespeare Head ed. (1926-27). There are eds. of the *Letters* by R. B. Johnson (1927) and L. P. Curtis (1934). See lives and studies by H. D. Traill, 1882; P. Stapfer, 1870; W. L. Cross,

1909, 1929; W. Sichel, 1910; L. Melville, 1911; A. de Froe, 1925; T. Yoseloff, 1948.

**Sterol**, see under **ERGOSTEROL**.

**Stethoscope**, instrument used in medical practice for ascertaining the condition of the respiratory and circulatory organs by observing the sounds made by them. The simplest form consists of a hollow tube terminated at one end by an ivory plate which is placed on the chest or other surface, and at the other end by a cup to fit the ear of the observer. The binaural S. consists of a Y-shaped tube, one arm being fitted with a small plate, and the other two with flexible tubing carrying metal or bone ear pieces.

**Stettin** (Polish *Szczecin*), tn. of Pomorze, Poland (Ger. before 1945), on the Oder, 30 m. from the Baltic and 37 m. S.S.E. of its outer port Swinemunde. From 1278 a member of the Hanseatic League, it was held by Sweden from 1648 to 1720, when it became Prussian. There are sev. fourteenth- and fifteenth-century buildings, and a Renaissance castle begun in 1503. Two gateways, the Berliner Tor and the Königsbor, are the remnants of the fortifications which stood till 1871. The squares, called the Königsplatz and the Kaiser Wilhelmplatz contain statues of Frederick the Great and Frederick William III. S. is the centre of the Baltic trade, owing to its central position, and to its rich hinterland, served by canal, rail, and the navigable Oder. There are extensive shipbuilding yards and dock accommodation, besides boiler and engine works, and soap, cement, and sugar factories, in the suburbs of Bredow, Grabow, and Zullehow, and many other manufs. Pop. 73,000.

**Stettinius, Edward Riley** (1900-49). Amer. business executive and administrator. *b.* at Harrison, New Jersey, and educated at Pomfret school, Connecticut and Virginia Univ. In 1926 he joined General Motors and in 1931 became a vice-president. In 1931 he joined the U.S. Steel Corporation, and subsequently became chairman of its board of directors. In 1939 he became also chairman of the War Resources Board, but resigned his positions in the Steel Corporation when President Roosevelt appointed him to the Advisory Commission to the Council of National Defence. S. will be chiefly remembered, however, for his work as Lease-Lend administrator, in which capacity he achieved great success, and, equally, as the representative of the U.S.A. in the early days of the United Nations, when he was under-secretary of state, playing a major role in the organisation of victory. He succeeded Sumner Welles in 1943 as under-secretary of state, and a year later succeeded Cordell Hull as secretary of state. His work at the Inter-Amier. conference at Mexico City confirmed his abilities as a negotiator, and was followed by President Truman appointing him as the first U.S. delegate to the United Nations Conference at San Francisco. In 1946, having suffered considerable strain in his war work, he resigned as Amer. representative on the Security Council and returned to business. He wrote

*Lease-Lend: Weapon for Victory* (1944), and *Roosevelt and the Russians: the Yalta Conference* (1949).

**Steuart, House of**, see **STEWART**.

**Steubenville**, co. seat of Jefferson co., Ohio, U.S.A., on the Ohio, 44 m. W.S.W. of Pittsburgh. It occupies the site of Fort Steuben, built in 1786. There are coal-mines, building-stone quarries, iron and steel works, and manufs. of glass, paper, and flour. Natural gas is found near by. Pop. 37,600.

**Stevenage**, small mkt. tn. in Hertfordshire, 28 m. from London. The church, dedicated to St. Nicholas, is mainly Early Eng. At the southernmost end of the tn. the Six Hills (tumuli) stand on a narrow strip of land alongside the Great N. Road, and many antiquarians incline to the belief that they are of Rom. origin. It has an ann. fair dating back to 1280. The grammar school was founded by Thomas Alleyn in 1558. Under the New Towns Act, 1946, a satellite tn. is being built adjoining the existing tn. and a Development Corporation has been set up for this purpose. Pop. 6,500.

**Stevens, Alfred** (1818-75). Brit. sculptor and decorative artist. *b.* at Blandford, Dorset, spent nine years of study in Italy (1833-42) including one year under Thorwaldsen at Rome. His greatest work was the bronze monument to Wellington in St. Paul's cathedral, which was left unfinished at his death, and was not completed till 1912. See study by W. Armstrong, 1881.

**Stevens, Alfred** (1828-1906). Belgian painter. *b.* in Brussels, studied under Ingres at the Ecole des Beaux-Arts, Paris. He settled in that city, and became a constant exhibitor in the salons. In the Brussels gallery are 'Lady in Pink' and 'The Lady-Bird.' 'At Home,' 'Consolation,' 'Ophelia,' and 'The Four Seasons' are other of his works, which were mostly interior scenes of middle-class life, influenced by Courbet. See studies by C. Lemonnier, 1906, and P. Lambotte, 1907.

**Stevens, John** (1749-1838). Amer. ship-builder and inventor. *b.* in New York, educated at Columbia Univ. He worked for the development of steamships, producing propellers in 1804, the first ironclad steamship in 1813, as well as other inventions, and helped to establish the modern Amer. law of patents.

**Stevenson, Robert** (1772-1850). Scottish engineer. *b.* in Glasgow, educated there and at Edinburgh Univ. He supervised the construction of a lighthouse on the is. of Little Cumbrae when he was nineteen, and, as engineer to the N. Lighthouses Commissioners, constructed the lighthouse on the Bell Rock off Arbroath Forfarshire (1807-11). He advised the use of malleable iron for railway lines, and designed bridges and roads.

**Stevenson, Robert Louis Balfour** (real name *Lewis*; he adopted *Louis*) (1850-94). Scottish writer. *b.* in Edinburgh, studied at the univ. there, was brought up to his father's profession of engineer. He abandoned this for law, and became an advocate in 1875, but never practised. Writing was always his delight; at the

age of fifteen he pub. a pamphlet on *The Pentland Rising of 1666*. His delicate constitution necessitated some visits abroad, but in spite of ill health he continued to write. He began in 1876 to contribute his brilliant essays to the *Cornhill Magazine*, and these laid the foundations of his fame, which extended rapidly in literary circles. These essays were collected in *Virginibus Puerisque* (1881) and *Familiar Studies of Men and Books* (1882). *An Inland Voyage* (1878) was his first book and later he pub. other records of his travels, such as *Travels with a Donkey in*

*Brodie* (1880, revised 1888). Thereafter his plays were written in collaboration with W. E. Henley. They include *Beau Austin* (1884); *Admiral Gueneva* (1884); and *Robert Macaire* (1885). In 1888 he sailed for the South Seas, settled in Samoa during the following year, and wrote the *Tailima Letters* to Sidney Colvin (1895). Among the Samoans, who have always cherished his memory, he was their friend Tusitala, 'teller of tales.' He died there, and was buried on Mt. Vaea.

S. gave a very attentive care to the art of writing, and his clear, exact, smooth style shows Fr. influence of the period of the symbolist revival. He imparted a high artistic quality to the adventure story. His novels serve the thirst for dramatic adventure, the poems reveal the unsophisticated emotions of youth, and the essays and studies analyse authors and their work with simplicity and directness. The classic, *Treasure Island*, besides its intensity and vividness, shows imaginative appeal, dramatic progress, and moral originality. His Scottish novels in sev. respects bear comparison with those of Scott, and the unfinished *Weir of Hermission* promised to be a masterpiece. In his writings on the South Seas are shown his keen sensibility to landscape, and a penetrating understanding of primitive souls. The essays, combining irony and clear-sightedness, somewhat resemble those of Charles Lamb in their essential subjectivity.

The Tusitala ed. of his works by Lloyd Osbourne (1923) contains five vols. of letters. See lives and studies by G. Balfour, 1901, 1915; H. B. Baildon, 1901; A. H. Japp, 1905; F. Swinnerton, 1914; Sir W. Raleigh, 1915; R. Masson, 1923; J. A. Stewart, 1924; G. S. Hellman, 1925; G. K. Chesterton, 1927; J. M. Carré, 1929; D. L. Dalgligh, 1937; D. Dalchos, 1948; and Lettice Cooper, 1948.

**Stevenson, Thomas** (1818-87), Scottish engineer, b. in Edinburgh. He joined with his father, Robert S. (q.v.), and his brother David, in lighthouse construction, making a particular study of lighting methods. He invented the thermometer screen, known by his name. There is a character sketch by his son, Robert Louis S. (q.v.) in *Memories and Portraits* (1887).

**Stevens Point**, tn. in Portage co., Wisconsin, U.S.A., on the Wisconsin, 150 m. N.W. of Milwaukee. Pop. 16,000.

**Stevenson, tn.** in Ayrshire, Scotland, on the frith of Clyde, 28 m. N.W. of Glasgow. There is an explosives factory of Imperial Chemical Industries estab. by Nobel at Ardeer. Pop. 12,000.

**Steward, Lord High**, see HIGH STEWARD OF ENGLAND.

**Steward of the Household, Lord**, in England, is the chief officer of the anct. court of the Board of Green Cloth, and was originally called the Lord Great Master of the Household. He has power over the finances of the royal household, and controls and selects all officers and servants except those of the chapel, chamber, and stable. He receives his charge from the sovereign and holds it during pleasure.



ROBERT LOUIS STEVENSON

A sketch by Sir William Blake Richmond.

*the Cerenns* (1879). S. went to California in 1879 and married an Amer., Mrs. Osbourne. The great success of the adventure story, *Treasure Island* (1882), finally decided his profession. Other stories include *Kidnapped* (1886); *The Black Arrow*, (1888); *The Master of Ballantrae* (1889); and *Catriona* (1893). In a very different vein was *Prince Otto* (1885), in which year he also pub. *The Dynamiter*, a sequel to *The New Arabian Nights* (1882), and written in collaboration with his wife. Another collaborator was his stepson, Lloyd Osbourne, who was responsible for much of *The Wrong Box* (1888); *The Wrecker* (1892); and *The Ebb Tide* (1894). Other pubs. are *A Child's Garden of Verses* (1885), *The Strange Case of Dr. Jekyll and Mr. Hyde* (1886); *The Merry Men* (1887); *Across the Plains* (1892); *Island Nights' Entertainments* (1893). At his death S. left unfinished *St. Ives*, the last six chapters of which were supplied by Sir A. Quiller-Couch (1899). S.'s earliest dramatic work was *Deacon*

**Stewart, Steuart, or Stuart, House of,** Scottish family tracing its descent from a Breton immigrant, Alan Fitzlaald, in the eleventh century. His son Walter (d. 1177) was made steward of Scotland by David I., and founded Paisley Abbey in 1163. The stewardship remained in the family, the various branches of which are descended from the seven sons of John (killed at Falkirk, 1298).

The first royal Stewart was the son of Walter, sixth steward, and Marjory, daughter of Robert the Bruce, and came to the Scottish throne as Robert II. in 1371. The direct royal male line ended at the death of James V. in 1542. His daughter Mary, who adopted the spelling 'Stuart,' claimed the throne of England on account of descent from Margaret Tudor, queen of James IV., and her son, James VI., became James I. of England and progenitor of the royal line of Great Britain. The Stuarts were excluded from the throne during the Commonwealth (1645-60), and after the flight of James II. of England the elder male line was permanently debarred. James II. was succeeded by his eldest daughter Mary and her husband, William of Orange, son of Mary, the daughter of Charles I., and they were succeeded by Anne, younger daughter of James II. The male line of James II. ended with the death of his grandsons, Charles Edward (the Young Pretender) and Henry, known as Cardinal York.

**Stewart, Balfour** (1828-87), Scottish physicist, b. at Edinburgh. He was director at Kew Observatory and, later, prof. of natural philosophy at Owens College, Manchester. He made discoveries in radiant heat, and was one of the founders of spectrum analysis.

**Stewart, David,** see ROTHESAY, DAVID STEWART, DUKE OF.

**Stewart, Dugald** (1753-1828), Scottish philosopher, b. in Edinburgh, educated at the high school and univ. there. He was appointed in 1785 prof. of moral philosophy in Edinburgh, but, though he retained the chair until within eight years of his death, he did not lecture after 1809. He was one of the Scottish 'common-sense' school. His works include *Elements of the Philosophy of the Human Mind* (1792-1827); *Outlines of Moral Philosophy* (1793); and *The Philosophy of the Active and Moral Powers* (1828). His works were collected by Sir Wm. Hamilton (1854-58). See life by J. Veitch, 1858, and F. Harrison, *The Philosophy of Common Sense*, 1907.

**Stewart, Sir John,** see LENNOX.

**Stewart, Robert,** see CASTLEREAGH.

**Stewartby,** tn. of Bedfordshire, England. The world's largest brickworks are here, producing over 9,000,000 bricks weekly, using the fine clay of the blue Oxford clay belt. The model vil. was built in 1927.

**Stewart Island, or Rakiura,** is. off the S. coast of South Is., New Zealand, crossed by 47° S. The coast is deeply indented and Paterson Inlet and Port Pegasus are good harbours. It is mountainous, and thickly forested, and is a holiday resort. Area 662 sq. m.

**Stewarton,** burgh and mkt. tn. of Ayrshire, Scotland, on R. Annock, 5 m. N.W. of Kilmarnock and 19 m. S.W. of Glasgow, with both of which it is connected by rail. It has manufs. of carpets, caps, and hosiery. Pop. 3000.

**Stewarts & Lloyds, Ltd.,** formed in 1903 by the amalgamation of A. and J. Stewart & Menzies Ltd. of Glasgow, and Lloyd & Lloyd Ltd. of Birmingham. These firms had both been in existence for over forty years and were, at the time of their amalgamation, the two largest makers of iron and steel tubes in Great Britain. To-day S. & L. Ltd., with its subsidiary and associated companies, employs more than 30,000 people, produces nearly three-quarters of the steel tubes made in the country, and at Corby, the biggest of the company's twenty-seven works in Great Britain, has constructed one of the most modern and completely integrated steel and tube works in Europe. In addition the company has important tube manufacturing interests in the countries of the Brit. Commonwealth.

**Stewing** (food), see under COOKERY.

**Steyer, Steyr, or Steir,** tn. of Upper Austria, at the confluence of the R. Enns and Steyr, 20 m. S.E. of Linz. There is a medieval old tn. with renaissance and baroque buildings. The centre of the Austrian iron industry. S. has manufs. of motor cars, bicycles, rifles, cutlery, paper, and woollens. Pop. 44,800.

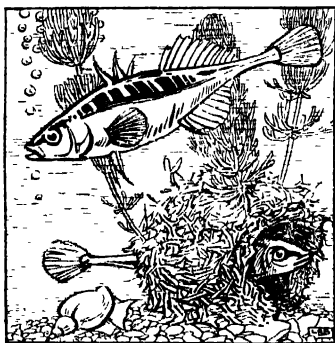
**Steyning,** tn. of Sussex, England, situated at the foot of the S. Downs, 12 m. from Brighton. It was formerly a seaport, the anc. Portus Cathmanni. It contains a Benedictine house, a shrine, and a Norman church and a grammar school, founded in 1614. Bramber Castle, close to S., was bought by the National Trust in 1945. Weekly markets are held and cattle fairs during the year. Pop. 2500.

**Stibnite,** chief ore of antimony; chemically antimony trisulphide, Sb<sub>2</sub>S<sub>3</sub>.

**Stick Insects,** family of orthopterous or straight-winged insects (Phasmidae), called also walking-sticks, most of them being mimetic insects resembling sticks, brown withered branches, or green growing twigs. Like other mimetic insects they are often able to escape detection when at rest in foliage. In the tropics some species attain a length of 13 in. Some four or five of six hundred known species are found in Europe.

**Stickleback,** popular name given to a genus of small fishes (*Gasterosteus*) of the family Gasterosteidae. They are small, and have elongated, compressed slender bodies, always without scales, but often protected by means of bony scutes. The anterior dorsal fin is represented by isolated spines, and the ventral fin is formed of a strong spine and one or two soft rays. The S. are noted for their nest-building habit, the males constructing them of leaves, twigs, and grass, and binding them together by a mucus which they secrete. They subsequently guard their young with great care. Nearly all the species are found in fresh water in Europe, Asia, and America, are very pugnacious,

and feed on spawn of other fishes. *Gastros-leus aculeatus* (the three-spined S.) and *G. pungitius* (the ten-spined S.) can live in either fresh or salt water; *G. spinachia* (or Sea S.) is a much larger and more slender species than those already mentioned; it is entirely marine and attains a length of 7 in., and is armed with fifteen short spines on the back. The flute-mouths or pipe-fishes which form the family *Fistulariidae* have been described as 'gigantic marine sticklebacks' and closely resemble species of *Gastrosleus*.



STICKLEBACKS

**Stiff-neck**, rheumatic affection of the muscles of one side of the neck, causing the head to be drawn to one side. S., as the term is ordinarily applied, is usually brought on by exposure to cold or wet, and especially affects individuals with a rheumatic diathesis. Movement gives rise to pain, and occasionally there may be spasm, causing the head to be immovable for the time being. Hot fomentations and general rheumatic treatment are indicated. Torticollis, or congenital S., is due to a defect of the sterno-mastoid muscle, usually through injury at birth.

**Stigand** (d. 1072), Eng. prelate. In 1047 he became bishop of Winchester, and undertook negotiations between Edward the Confessor and Godwin (1051-52). When the latter re-established his position in England, Robert of Jumièges (q.v.) fled, and S. was uncanonically appointed archbishop of Canterbury in his place. In 1052, and was accordingly excommunicated (by five popes successively), but received the pallium from the antipope Benedict X. in 1058. In 1070 he was charged with various eccles. offences by the papal legate, deprived of his see, and imprisoned.

**Stigma**, in botany, the summit of the ovary or of the style in flowering plants. Usually it is swollen and covered with glandular papillae and specially adapted to retain the pollen grains brought by the wind, insects, or other agencies in the process of pollination. In shape S. may be round or square, and also either feathery or petaloid.

**Stigmatisation** (Medieval Lat., *stigmatizare*, from Gk. *stigma*, a mark, puncture), impression on certain individuals of the 'stigmata' or five wounds in the hands, feet, and side which Jesus received in His Passion, generally held to be given miraculously as a mark of signal favour to those specially devoted to meditation on the Passion. St. Paul's words in Gal. vi. 17 should not be taken as an assertion that he bore the stigmata. The earliest and the most striking instance is therefore that of St. Francis of Assisi, of which full accounts are given in his life. Since that time over 300 instances have been collected, of which twenty-nine occurred during the nineteenth century, and Therese Neumann (q.v.) is still living. The cases of Catherine Emmerich (1774-1824) and Louise Lateau (1850-53) attracted considerable attention. Explanations of the admitted physical facts vary, some believing that the phenomena can be naturally explained without recourse to special divine intervention. The Rom. Church does not treat S. as an incontestable miracle. See A. Imbert-Gourbeyre, *La Stigmatisation*, 1894, and I. Dannemarie, *Le Mystère des stigmatisés*, 1933.

**Stülfersjoch**, see STELVIO PASS.

**Still, Andrew Taylor** (1828-1917), Amer. osteopath, b. in Jonesboro, Virginia. He is said to have attended Holston College, Newmarket, Tennessee, and he founded osteopathy as it is known to-day in 1874. He met with a great measure of opposition, but he and those who followed his teaching gradually won recognition. In 1892 he founded the Amer. School of Osteopathy at Kirksville, Missouri. His books include *Philosophy of Osteopathy* (1899) and *Osteopathy, Research and Practice* (1910).

**Still, John** (1543-1608), Eng. prelate. He was rector of Hadleigh (1571), canon of Westminster (1573), master of St. John's College, Cambridge (1574), and of Trinity (1577), bishop of Bath and Wells (1593). The authorship of *Gammer Gurton's Needle* has been ascribed to him.

**Still, see** DISTILLATION.

**Stillborn**, see OBSTETRICS, FETUS, ABORTION, etc.

**Still Life**. The grouping of objects on a plane near the spectator as a subject for painting is hardly known till the fifteenth century. With Rubens groups of weapons, fruit, and flowers assist understanding of mythology and give decorative magnificence. Jan Brueghel earlier had excelled as a flower painter (see FLOWER PAINTING). Beautiful groups are found in the foregrounds of Titian, Tintoretto, Veronese. The seventeenth-century Dutch school showed special aptitude through pride in home and furnishings. Furthermore, their love of light effects led to artistic treatment of tone, colour, texture, for their own sake (Ter Borch, Metsu, Brouwer, Steen, de Hooch, Ostade, Teniers, Vermeer). Rembrandt lifts the genre to the highest plane in his 'Flayed Ox,' a repulsive subject dignified by his vision, invested with drama and interpreted in lovely paint. The pots and pans of

Velazquez reflect Sp. gravity, while Chardin's works interpret Fr. homeliness, 'the poetry of the real,' and are a vehicle for ravishing colour schemes. Hogarth's narrative paintings contain fine passages of S. L. painting.

In the nineteenth century a change comes through Impressionism. Renoir, delighting in fruit and flowers, bathes them in rosy sunlight. Gauguin brings decorative interpretation by emphasis on contour, arabesque, and silhouette in deep exotic colour. Van Gogh, powerfully affected by 'things,' and their life-hist., paints with forthright flat colour, enlivened by pointillism and violently rhythmical line. The absence of shadow shows Jap. influence. Cézanne's painting reveals the disciplining of a romantic temperament; powerful forces seem held in tension. His pictures have the power to compel an equal attention to a design on the picture-plane (second dimension), and the idea of a composition in depth (third dimension). His geometrical simplifications foreshadow Cubism, in whose early phases there is much intersecting of crystalline forms (in monochrome). In mature Cubism there is reliance on flat colour areas, pattern, and line which reinforcing edges and crossing spaces, binds the design together. Though near abstract there is feeling of depth, weight, solidity. The effect of the Cubist movement has been invigorating to the *genre* and S. L. remains, with landscape, a much-practised art. See M. Friedländer, *Landscape, Portrait, Still Life*, 1949.

**Stillman, William James** (1828-1901), Amer. painter and journalist, *b.* at Schenectady, New York. In 1850 he went to England, where he met Ruskin and Turner and came under the influence of Rossetti and Millais. In 1852 he went on an unsuccessful mission for Kossuth (*q.v.*) to dig up the buried Hungarian crown jewels. On returning to America he devoted himself to landscape painting and founded the *Crayon*. He lived for some time at Cambridge, Massachusetts, then went to London, visited Switzerland with Ruskin, lived in France, became U.S. consul at Rome (1861) and at Crete (1865), and settled in Athens in 1868. He was *The Times* correspondent in Herzegovina (1875), at Athens (1877-83), and at Rome (1886-98).

**Stillwater**, co. seat of Washington co., Minnesota, U.S.A., on St. Croix R., 16 m. N.E. of St. Paul. At the head of navigation on the riv., it has a lumber trade and sev. manufs. Pop. 8000.

**Stilt**, term applied to any species of *Himantopus*, a genus of Charadriidae, which has a very wide distribution. The name is given to these birds by reason of their thin, long legs, which extend far behind the body of the bird. Some half-dozen or more species of *S.* are known, and they inhabit both the E. and W. hemispheres, though they do not range N. of the temperate regions. *H. himantopus* is a rare visitor to the Brit. Isles, most frequently, in summer, to the E. and S. counties. *H. melas*, *H. novaezeelandiae*, *H. leucocephalus*, and other species belong

to the Australasian region; *H. brasiliensis* to South America; and *H. knudseni* the Sandwich Is.

**Stilton**, vil. of Huntingdonshire, England, 7 m. S.W. of Peterborough and situated on the Great North Road. It gives its name to a slow maturing, semi-hard, blue cheese made in Leicestershire, Huntingdonshire, and Rutland, and originally sold at S. Pop. 800.

**Stilts**, poles provided with stirrup-like projections for the feet at a certain distance from the ground, and used for walking over rough or marshy places. Stilt-walking has been for long a form of amusement. *S.* are used regularly in Landes, a dist. of Gascony, and the Marquesas and other Pacific is., and stilt-races are a favourite feature of festivities in the former locality. They also figure in It. masquerades.

**Stilwell, Joseph W.** (1883-1946), Amer. soldier, *b.* in Florida, trained at W. Point Academy, graduating in 1904. He served in the Philippines (1904-6), and became an instructor at W. Point (1906-19). Thereafter service in China and study of the language made him one of the foremost authorities on Chinese life in the U.S.A. In the First World War he served in France. When Japan attacked the U.S.A., *S.* was at once chosen as U.S. military representative in China. Gen. Chiang Kai-shek appointed him chief of staff and commander of the Fifth and Sixth Chinese armies, co-operating with the Brit. forces in the defence of Burma. Cut off with his meagre forces from supplies after the Jap. had captured Mandalay and Lashio (1942) he led the remnants of his troops in a remarkable retreat across the mts. to India, and returned to Chungking by air to resume the struggle from there. From Oct. 1913 *S.* conducted an advance of over 200 m., pushing the Jap. 18th Div. back to their main base, Myitkyna, supported in this by the Fourteenth Army and other allied forces. *S.* was not by temperament suitable for his position as second-in-command in S.E. Asia and chief of staff to Chiang Kai-shek, lacking in tact and political insight, and having little liking for the Brit. He was primarily, and most successfully, a fighting soldier. After an open breach with Chiang Kai-shek *S.* was given a home command in the U.S.A. He was appointed to command the Amer. Tenth Army at Okinawa, where he played his part in the final act of Japan's defeat. See further under BURMA, SECOND WORLD WAR CAMPAIGNS IN. See T. H. White (ed.) *The Stilwell Papers* (selection of notes from his war journal, papers, and letters), 1949.

**Stimson, Henry Lewis** (b. 1867) Amer. statesman, *b.* in New York city, educated at Yale and Harvard Univ., and began practice at the Bar of New York city in 1891. He was appointed U.S. Attorney for the S. dist. of New York state, serving from 1906 to 1909, and successfully attacking sev. trusts and combines. In 1910 the Republicans nominated him for governor of New York state, but he was defeated. President Taft made him

secretary of war (1911-13), and he did good work for the efficiency of the army. During the First World War he served in the army, ending as colonel of the 31st Amer. Field Artillery. He was governor-general of the Philippine Is. (1927-29). In March 1929 President Hoover appointed him secretary of state, a post he held until 1933. He headed the Amer. delegation to the London Naval Conference (1930); was a delegate to the Seven Power Conference in London (1931), and a member of the Permanent Court of Arbitration, The Hague (1938). In 1940 S. was appointed secretary of war, a position in which he did work of the greatest importance for the strength of the Amer. war effort. His pubs. include *Democracy and Nationalism in Europe* (1934); *The Far Eastern Crisis* (1936); and his memoirs, *On Active Service in Peace and War* (with M. Bundy, 1949).

**Stimulants**, agents that increase functional activity. They may be general, exciting the body as a whole to greater activity, or may affect particular organs, as cardiac, renal, hepatic, gastric, cerebral, and others. They are distinguished from tonics by their more immediate and transient action. It often happens that while a small dose of a stimulant causes greater intensity of vital processes, a larger dose or repeated small doses tend to cause depression. Thus, alcohol is an effective stimulant in moderate doses, but if its use be continued, the vital processes become much depressed, so that collapse is an important symptom of alcoholic poisoning. The most common S. are alcohol, ether, ammonia, tea, coffee, various essential oils, strychnine, amphetamine ('benzedrine'), electricity, heat and cold under certain conditions, etc.

**Stinging Animals and Plants.** Though commonly used as a means of defence both in animals and plants, the power of inflicting a wound and introducing a poisonous fluid is employed by many animals as a means of securing their prey. One of the lowest stinging animals is the hydra, which has a number of cells in the tentacles (see **THREAD CELLS**). The poison glands of spiders are in appendages near the mouth. The Black Widow spider of N. America is the only species likely to be dangerous to man. A number of fishes, notably the sting rays (*q.v.*) and the weeviers, have also stinging powers. Stinging plants (*e.g.* nettle) are usually furnished with sharp stiff hairs which secrete an acrid fluid, which in the nettle contains the irritating substance histamine. Some (*e.g.* the poison ivy of N. America) are capable of causing serious results. See also **INSECT BITES AND STINGS**.

**Stinging Cells**, see **THREAD CELLS**.

**Sting Ray**, any individual of the family *Trygonidae*, but specifically *Trygon pastinaca*, a fish of the tropical seas, and found also around the S. shores of England, in which a serrated spine is present on the whip-like tail. This spine projects upwards and backwards and may inflict a severe wound. Species of *Pteroplatea*, in the same family *Trygonidae*, are also able to cause deep and poisoned wounds.

**Stinking Camomile**, see **MAYWEED**.

**Stinkwood**, term applied to the wood of numerous plants, is used especially in reference to *Gustaria augusta*, a species of *Lecythidaceae*. The wood has a foetid smell, and the tree occurs in tropical America.

**Stinnes, Hugo** (1870-1924). Ger. industrial magnate, b. at Mulheim, youngest son of Mathias S., proprietor of coal-ships. At twenty-three he founded 'Hugo S.', capital 50,000 marks. S. became a proprietor of mines, and estab. depots on the North, Baltic, Mediterranean, and Black Seas. He was the chief figure in Deutsch-Luxemburgische Bergwerks-und-Hütten A.-G., estab. in Bochum in 1901, and Rheinisch-Westfälische Elektrizitätswerk A.-G., which supplied numerous tns. with gas and electricity. During the First World War he acquired large holdings in iron-mines, steamship lines, newspapers, and hotels, and achieved immense power in Ger. economic life, his largest concern being the Siemens-Rheinelbe-Schuckert Union. This was rescued from difficulties after his death by his sons, with Amer. support, and under Hitler was a prin. component of the armament and engineering industries. See *lives and studies* by G. Raphael, 1924, and K. Albach, 1925.

**Stipa pennata**, or **Feather Grass**, hardy perennial grasses of the family *Gramineae*. They grow about 2 ft. high, and flower in summer.

**Stipend**, originally the pay of soldiers; but now means the ann. allowance or income of an eccles. benefice, though in a wider sense it denotes any settled pay for services whether daily, monthly, or ann. In Scotland the term applied specifically to the provision made for the support of the parochial ministers of the old Established Church, consisting of payments made in money or (formerly) grain, or both, varying in amount according to the extent of the par. and the state of the free tithes (see **TITHES**), or of any other fund specially set apart for the purpose. In the Rom. Catholic Church S. also denotes the fee which a priest is entitled to demand for saying mass. 'Stipendiary' in a wide sense means one who performs services for a settled compensation, but has come specifically to denote a paid police magistrate acting in the metropolis or large prov. tns. See **POLICE**.

**Stipple Engraving**, see **under ENGRAVING**.

**Stippling**, in interior decorating, the production of a finely granulated surface on paintwork, achieved by beating the wet surface with a flat-faced bristle brush. Use is made of stipplers with rubber plates or cylinders on surfaces of coarse texture. S. is used on oil-bound, quick setting flatting paint. An even change from one colour to another can be obtained by this method.

**Stirling-Maxwell, Lady**, see **NORTON, CAROLINE ELIZABETH SARAH**.

**Stirling, William Alexander, Earl of**, see **ALEXANDER**.

**Stirling**, royal burgh since the twelfth century, occasional riv. port, and co. tn. of Stirlingshire, Scotland, situated on the R. Forth, 21 m. N.E. of Glasgow, and



37 m. N.W. of Edinburgh by rail. Its strong strategical position has made it the key to the Highlands. In and around the town have been enacted some of the most thrilling episodes in the hist. of Britain. Through the centuries, from Saxon and Rom. times, can be traced its influence on the monarchs and fortunes of Scotland. The castle dates from a Rom. station about A.D. 81, and was the bp. and residence of sev. Scottish kings. The view from the castle walls is unique for interest and beauty, including the field of Bannockburn (1314), S. Old Bridge, the Abbey Craig with the Wallace Monument, Cambuskenneth Abbey, and the sinuous reaches of the Forth. The prin. industries are agric. implements, bacon curing, brush-making, carpet weaving, floorcloth, and woollen goods. The S. and Falkirk Dist. of Parl. Burghs (S., Falkirk, and Grangemouth) return one member. Pop. 28,500.

**Stirling**, Brit. aircraft made by Short Brothers, the first of the four-engined heavy bombers used by the R.A.F. from 1939 to 1945. From its first going into service in 1941, carrying what was for those days an unusually heavy bomb load, it was employed on operations throughout the war years and was used on a diversity of duties. The S. was powered with Bristol Hercules engines; it was well armed, having power-driven gun turrets in the nose, tail, and upper portion of the fuselage.

**Stirlingshire**, W. midland co. of Scotland, bounded on the N. by Perthshire, N.E. by Clackmannanshire, E. by the firth of Forth and W. Lothian, Lanarkshire, and part of Dunbartonshire, and W. by Dunbartonshire. S. is one of the most picturesque cos. of Scotland, situated midway between the Highlands and the Lowlands. There are two large plains, known as the carse of Falkirk and Stirling, containing some of the most fertile land in the country. A range of ridges traverses the co., comprising the Campsie Fells, Pintry, Gargunock, and Kilsyth or Lennox Hills. Ben Lomond (3192 ft.), part of the Grampian Range, is situated on the N. bank of Loch Lomond, famous in song and story. The prin. rvs. are the Forth, Allan, Avon, and Carron. There are angling facilities on the rvs. and also on various lochs and reservoirs. S. is rich in minerals, with large seams of good quality coal, while fire-clay, ironstone, limestone, and sandstone, are also available. Agriculture flourishes throughout the co., and particularly along the valley of the Forth, where large crops of barley, beans, corn, potatoes, turnips, and wheat are raised. There are fine grazing lands on the slopes of the central and southern hills for cattle, and large flocks of sheep, chiefly Scotch Blackface and Cheviot breeds. The prin. industrial area is centred on Falkirk. The chief industry is the manuf. of iron goods, notably by the Carron Company. Bookbinding, brewing, timber, and the making of bricks, carpets, dyes, paper, soap, tweeds, and woollen goods is also carried on. Stirling (q.v.) is the co. tn.

and Grangemouth, where shipbuilding is engaged in, is the prin. port. These two towns, with Falkirk, send one member to Parliament; East S. with Clackmannanshire, and West S., each send one. Area 288,560 ac. Pop. 187,200.

There are evidences of Rom. occupation, and sections of the Antonine Wall near Falkirk are preserved as anct. monuments. Numerous battles have been fought in this co., viz.: Stirling Bridge (1297), Falkirk (1298 and 1746), Bannockburn (1314), and Sauchieburn (1488), where James III. was defeated and murdered in the nearby vil. of Milton. See K. M. Randall, *History of Stirling*, 1817; W. Nimmo, *History of Stirlingshire*, 1880; J. W. Small, *Old Stirling*, 1897; J. C. Gibson, *Larbert and Dunipace Parishes*, 1908; E. Stair-Kerr, *Stirling Castle*, 1928; W. D. Simpson, *Stirlingshire*, 1928; and J. Stewart, *Falkirk, a History*, 1940.

**Stitch**, sharp pain in the side. It may be caused by pleurisy, by spasm of the respiratory muscles during violent exercise, or by intercostal neuralgia.

**Stitchwort**, see STELLARIA.

**Stoat**, or **Ermine** (*Mustela erminea*), carnivorous mammal, native of Britain, with a much elongated body covered with short fur which generally retains its reddish-brown colour in Britain, but in colder lat. (including N. Scotland) becomes partially or wholly white and much denser, and is then highly valued by furriers. The S. is about 10 in long, with a black-tipped tail about 5 in long. It destroys enormous numbers of rats and mice, and this service is probably worth the loss the S. causes by destruction of game. It is closely related to the weasel (q.v.)

**Stock**, term usually associated in the public mind with shares and dealings on a S. Exchange, though negotiability on a S. Exchange is not an essential incident of S. *British Government Stock*.—The gov. invites the public to share in a loan. Each subscriber is allotted S. for his accepted contribution, e.g., War S., Funding S., Consolidated S. (Consols). Also S. has recently been issued in exchange for proprietary interests in nationalised industries, e.g. Brit. Transport S. Thereafter the S. may be bought or sold through the medium of a S. Exchange, the price at which it is transferred varying according to credit conditions prevailing at the time. Interest at an agreed rate is paid, usually half yearly. The terms of issue provide whether the S. shall be redeemed within a certain time or at the option of the gov. Most gov. S. can be transferred from one holder to another in multiples of one penny.

*Dominion Government Stocks* are similar to Brit., except that the revenues of the dominion concerned are alone liable for the service of the loan. These S. are freely negotiable on the London and other S. Exchanges.

*Stock of Public Authorities* such as the *Port of London Authority* and *Metropolitan Water Board*.—Such authorities borrow funds to build and equip their docks and other structures, and their revenues

provide periodical interest and ultimate repayment of the funds borrowed in accordance with the contract made when the S. is first offered for subscription. See further under COMPANY AND COMPANY LAW.

**Stock** (botanical), abbreviation of S. gillyflower, *Matthiola incana*. The wild Brit. species is included in the genus *Matthiola*. All the garden varieties of the simple-stemmed S. and of queen's S. have been derived from *M. incana*; those of ten weeks' S. from *M. annua*; while the smooth-leaved ann. S. are derived from *M. græca*. The wallflower-leaved S., *M. tristis*, is a small plant, with narrow hoary leaves and dull brown flowers; it grows in S. European countries, and is the night-scented S., which is grown in greenhouses for its fragrance by night. Similar fragrant species are *M. lrida* and *M. odoratissima*. *M. fenestralis* is the window-S. See also GILLYFLOWER; MATTHIOLA; VIRGINIA STOCK.

**Stockbridge**: 1. Mktt. tn. of Hampshire, England, 8 m. W.N.W. of Winchester. It is an angling centre and has racing stables. Pop. 820. 2. Tn. in Berkshire co., Massachusetts, U.S.A., 17 m. S. of Pittsfield. Ice Glen, Prospect Hill, and Lake Mahkeenac, the latter being near the house where Nathaniel Hawthorne wrote his works, are all places of interest. Pop. 1800.

**Stock Exchange**. The function of the S. E. is to provide a market in which stocks and shares of all descriptions can be freely bought and sold, and in which the provision of new finance for governmental or industrial purposes can be facilitated through the flotation of new issues of capital. The S. E., London, colloquially termed the 'House,' occupies an area of about 1 ac. and is situated in the triangle formed by Throgmorton Street, Old Broad Street, and Bartholomew Lane, in the city of London. There are nearly 4000 members and over 900 clerks who are admitted to the dealing floor. A recent authoritative statement on the function of the London S. E. is quoted here. 'The Stock Exchange in 1949 transacted business in a total of £4000 millions of British Government stocks alone, an average of some £16 millions each working day. It provides as free a market as possible for the purchase and sale of some 10,000 different securities with a total value exceeding £26,000 millions, covering the entire field of governmental, municipal, and commercial finance. The Stock Exchange market is used not only by countless small investors, but by governments, nationalised boards, trade unions, co-operative societies, the public trustee, banks, insurance companies, public and private companies, and by innumerable pension funds and charitable trusts. Through the machinery of the Stock Exchange a large proportion of the nation's assets and income is made liquid for collection by the government in the form of death duties or as income or surtax. The Stock Exchange is not an isolated organisation that can be considered by itself. It is an essential and

inseparable part of the financial machinery of the country without which neither the government nor the commerce and industry of the nation could function efficiently. This indispensable machinery stands behind every life insurance policy, every pension, every salary and every pay-packet.'

**Finance**.—The capital was originally £720,000 in 20,000 shares, £36 paid, but was altered in March 1948 by reducing each share to 1s. fully paid, 40,000 redeemable annuities of £4 per annum being issued *pro rata* to shareholders as compensation. These annuities may be held by non-members and a considerable proportion of these is now so held. The properties were valued in the balance sheet for the year ending March 24, 1949, at £1,721,263, against which there are debenture issues of £500,000.

**Constitution**.—The constitution of the S. E., which was founded before the close of the eighteenth century, is laid down by a Deed of Settlement of Dec. 31, 1875, which superseded the original Deed of Settlement of March 27, 1802. Control is vested in a council which is elected by members and consists of an executive body of not less than thirty and not more than thirty-six members. No one can be elected to the council unless he is, and has been for the previous five years, a member of the S. E. The council is responsible for the rules and regulations which are enforced by strict disciplinary powers, and, supplemented by a traditional integrity among the members based upon the motto 'Dictum meum pactum,' maintain a high standard of honesty and fairness in dealings by members for the public. The disciplinary powers of the council include the power to censure, to suspend a member from entry to the House, and to expel a member from the S. E. In general the business of the council is concerned both with the internal management of the S. E. for the members and with external matters relating to the public interest. The granting of quotations to new issues of capital under further safeguards is also an important part of the council's work. Routine business is mainly delegated to standing committees who are responsible to the council, though all major questions of policy are decided by the council itself.

**Membership**.—A candidate for membership must be not less than twenty-one years of age and must be recommended by three members of four years standing, each of whom must engage to pay £500 to the creditors of the candidate in case the latter shall be declared a defaulter within four years from his date of admission. He must also be nominated by a retiring member. For such a candidate the entrance fee is £1050 and ann. subscription £105. If, however, the candidate has served as a clerk in the House for four years two recommenders only are required for £300 each, and the entrance fee and ann. subscription are £525 and £52 10s. respectively. These benefits are a strong inducement and the result is that nearly two-thirds of the members have taken up

membership after having served their apprenticeship for four years. Clerks are employed in three categories. 'Authorised' clerks are allowed to carry out dealings, 'Unauthorised' clerks have the right of entry to the House but may not deal, and 'Settling Room' clerks may only enter that part of the House set aside for the daily routine of checking the bargains effected on the previous day. The entrance fee for an Authorised clerk is £52 10s. and the ann. subscription is £105, for an Unauthorised clerk £15 15s. and £31 10s. respectively, and for a Settling Room clerk there is an ann. subscription only of £10 10s. An Authorised clerk must be at least twenty-one years of age and Unauthorised and Settling Room clerks sixteen years.

**Brokers and Jobbers.**—The members are divided into two categories, namely brokers and jobbers, and carry on their business either as individuals or in partnership. A broker may not enter into partnership with a jobber. Brokers act as agents in buying and selling for members of the public, receiving a commission on the business done; they carry out orders in any class of security which the client desires to buy or sell. It is also their business to advise clients on questions of realisation and investment; to make and certify valuations for probate; and from time to time to advise and assist companies in the raising of capital; and in this connection to effect placings or to procure underwriting for new issues. Members of the S. E. are not allowed to advertise or to approach persons other than their own principals.

Jobbers are principals, dealing on their own account. They may not deal with the public, but only with other members of the S. E. They do not deal in all securities indiscriminately, but specialise in one or more groups of securities, or 'markets' as they are called; e.g. gilt-edged stocks (consisting mainly of Brit. Gov. securities); insurance shares; bank shares, foreign gov. bonds; the shares of mining, or brewery, or investment trust companies; or in one or more of the many sub-divs. of the great mass of commercial and industrial companies. Other 'markets' are those for oil, rubber, tea, and nitrate shares. The trading floor of the House is divided by custom into these various markets, where the jobbers specialising in those particular securities have their stands, i.e. places where they stand and may always be found. The brokers move all over the floor contacting those jobbers whom they need for the particular business in hand. The jobbing system is peculiar to the London S. E. and its existence tends to eliminate violent fluctuations in prices.

**Dealing on the Stock Exchange.**—A broker on receiving an order from a client approaches a jobber who specialises in the particular type of security, and if the price made by the jobber is acceptable he deals with that jobber. By the custom of the S. E. a jobber may not ask the broker whether he is a buyer or a seller and therefore, when asked for a quotation, he

always names both his buying and his selling price; this is called 'making a price.' He makes his price as far as he can judge by the law of supply and demand; the idea that the jobbers fix or control the prices of securities is a misconception. A jobber may, but is not likely to, refuse to make a price in active securities. The difference between the buying and selling price varies according to the volume of dealings. Where dealings are frequent and the jobber can 'undo' his bargain without difficulty, he makes a 'close' price, but where dealings are less frequent he has to make a wider price, because he carries the greater risk of being unable to do the reverse bargain and make his profit or cut his loss.

A jobber who has made a price is bound by custom to deal at that price in a reasonable amount of stock or shares. If the transaction is larger or smaller than normal, the amount in which the price is made is decided by discussion between the two parties. For instance, in answer to a broker wanting to deal in a certain gov. stock, a jobber might make a price of 96½ to 96¼ in a £100,000 stock, indicating that he is willing to buy £100,000 at 96½ per cent or sell a like amount at 96¼ per cent. If the broker's order is for £500,000 stock, he would ask the price in that amount and the jobber might either be willing to deal at that price or, because of the greater risk, feel obliged to widen the difference between the buying and selling prices. Further bargaining may then take place before the deal is concluded. A broker after executing an order for a client must send him a contract note duly stamped which, *inter alia*, gives the title of the security, the amount purchased or sold, the relative price and value, and the date by which payment has to be made. It is the broker's duty to see that all bargains are made at the best possible prices for his client and that share or stock transfers are duly registered with the company and the relative document of title obtained for them.

**Settlement of Bargains.**—Brit. funds, etc., corporation and co. stocks (Great Britain and N. Ireland), public boards, dominion, prov., and colonial gov. securities are dealt in 'for cash', and the buying broker is liable to pay on the following day in return for delivery of the stock. Other securities, unless dealt in by special arrangement, are bought or sold for 'the account' and bargains are settled on the account days which are fixed annually by the council and normally recur at fortnightly intervals.

**Continuation Facilities.**—A continuation (or *contango*) is an arrangement for carrying forward the settlement of a transaction from one account to the next. The normal arrangement is for the buyer who does not wish to take up his stock to pay a rate of interest to a seller who is willing not to deliver, and who in effect therefore lends to the buyer the money value of the transaction. Continuations form a useful part of the machinery for maintaining free markets. They provide a means of bridging delays in delivery

between London and overseas exchanges, or delays arising from other causes. They also enlarge the scope of the jobbing technique and enable jobbers to be more free and more flexible in their price making, since they can, by means of continuations when they are available, carry over an uncovered position from one account to another instead of being compelled to level their books at the end of each account—a process which may be disadvantageous not only to themselves but to the market in which they operate. Continuations can also be used as a medium for speculation, and were largely so used in the past. Many brokers now will not entertain speculative continuations, and, where they are entertained, substantial margins are usually required as a protection against loss. Continuations, for whatever purpose they are entered into, are transactions in real values which must ultimately be settled.

Option dealing has also a useful function in the maintenance of free markets, but, like continuations, it can also be used for purely speculative purposes. Option dealing ceased on the outbreak of war in 1939 and has not yet been reintroduced.

*Dealing Ex & Cum Dividend or Ex & Cum Rights.*—‘Ex-div’ or ‘x.d.’ means that if a buyer has bought a security so marked, the current dividend belongs to the seller and the price then no longer includes the value of the dividend. ‘Cum div.’ means that the buyer has the right to the dividend due to be paid, and should it be sent by the company to the seller the amount must be paid over by him to the buyer. Similarly ‘cum rights’ means that in a transaction any advantage, perhaps in the form of an offer of new securities on favourable terms or a free issue of shares by means of capitalising reserves (sometimes called bonus shares), passes to the buyer, while ‘ex rights’ means that such advantage remains with the seller. Gov. and other securities dealt in in the gilt-edged market are quoted ‘ex dividend’ on and after the day on which the books close or the balance is struck for the payment of dividend; registered securities of industrial, etc., companies are quoted ‘ex dividend’ on the making-up day (five days before the account day) preceding the first day on which the transfer books are closed for the payment of the dividend. Bearer securities are quoted ‘ex dividend’ on the day the dividend is payable.

*Arbitrage Dealing.*—The term ‘arbitrage’ refers to professional dealings between London and overseas exchanges, and consists in buying in one exchange and selling in another. Either brokers or jobbers can obtain from the council authority to do this type of business.

*Securities which may be dealt in.*—Brokers and jobbers may deal only in securities which have been granted quotation by the council, and certain other securities which fall within a narrow classification. To obtain quotation the company or other issuer of the security must comply with stringent regulations imposed by the council in addition to the

requirements of the law. Companies are willing to co-operate in fulfilling the regulations in order to obtain a market for their securities. The council, in granting a quotation, express no opinion as to whether or not a company will achieve the success to which it looks forward, but every effort is made to see that the proposition is put fully and fairly before the public, and that no known rogues or undesirable persons are connected with it. On the grant of quotation a company must pay a fee calculated on the money value of the security issued.

*The Stock Exchange Daily Official List.*—This list is compiled from securities quoted and the bargains marked. The official ‘marking’ is made up from the marking slips signed by the broker or jobber recording transactions effected before 2.15 p.m. Transactions after that hour on the same day may be marked on the following morning and will then bear a distinguishing sign to show that they were done on the previous day. Except for the few transactions, which owing to special circumstances are effected outside the market price and bear a distinguishing mark, all recorded transactions represent bargains done at the market price, at the time of dealing. Fluctuations in prices are sent out by the Exchange Telegraph Company on automatic machines (‘tape prices’). On April 4, 1949, the value of all securities officially quoted was £26,163,000,000 of which £14,613,000,000 consisted of Brit. Gov. securities; these and others of nearly equal status are colloquially called ‘gilt-edged.’ The volume of dealings in the gilt-edged market alone is very large and the turnover in this market during 1949 amounted to £1,000,000,000.

Other official pubs. of the council are the *Stock Exchange Weekly Official Intelligence* and the *Stock Exchange Official Year Book* which gives details of some 8500 companies.

*Scale of Commissions.*—The minimum scale of commissions varies according to the type and price of the security. The detailed scale may be obtained on application to the secretary of the S. E. Brokers are allowed to share their commissions with agents who are approved by the council and whose names appear in one or other of the registers of agents kept by the council pursuant to the agency rules.

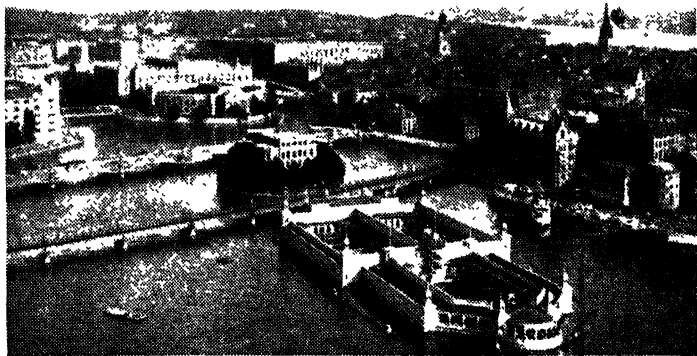
*Provincial and Overseas Exchanges.*—In addition to the London S. E. there are exchanges in twenty-two cities and towns of the United Kingdom and the republic of Ireland. The prin. of these are Belfast, Birmingham, Bristol, Cardiff, Dublin, Edinburgh, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Nottingham, and Sheffield. The membership of these twenty-two exchanges is approximately 1000 and together they constitute a body called the Associated S. Es. Stockbroking firms exist also in a large number of smaller towns, scattered all over the United Kingdom and the republic of Ireland. These firms constitute the Prov. Brokers S. E., the membership of

which is approximately 400. Both of these bodies work in co-operation with the London S. E. and have adopted substantially the same rules. Throughout the empire and the U.S.A., and in many foreign countries, there are S. Es. having business relations with the London S. E.

**Stockholm**, cap. of Sweden, lies where Lake Mälaren joins Saltsjön, an inlet of the Baltic thickly dotted with is. The oldest part of the city is built on the is. that separates the two stretches of water. Here it grew up in the middle of the thirteenth century round the fortress that had been erected to guard the vital entrance to the trading centres of Lake Mälaren. On the foundations of this old fortress there now stands the imposing

holmen, immediately to the W. of Gamla stan, is the Franciscans' old church, once the centre of their monastic buildings, and later Sweden's Pantheon, where her kings are buried. Formerly the municipal as well as the national govt. was concentrated round this part, but now both the law courts and the city hall are on the is. of Kungsholmen. The Stadshuset (city hall), which is S.'s best-known building from modern times, was designed by Ragnar Östberg and opened in 1923. It combines southern influences with N. brick architecture, and has an extremely beautiful situation on the very shore of Mälaren.

S. extends N. and south of the Old Tn. across the so-called 'malm' areas - Norrmalm, Östermalm, and Södermalm -



STOCKHOLM, FROM THE TOWN HALL

*D. McLesh*

royal palace, built to the design of Nicodemus Tessin the younger (1697-1754). Its exterior bears the stamp of the Rom. Renaissance style, while inside there are many exquisite examples of eighteenth-century art from home and abroad. Close to the palace is Storkyrkan S.'s episcopal church, the oldest parts of which date from the thirteenth century. Among other things it contains a famous group, representing St. George and the Dragon, executed by the Lübeck sculptor Bernt Notke at the end of the fifteenth century. To the south of these predominant buildings extends an area of dwelling-houses dating from medieval times, with narrow twisting streets and lanes.

There are a number of official and administrative buildings in Gamla stan, the Old Tn., including Riddarhuset (the House of the Nobility), Hogsta domstolen (the supreme court), and Kanslihuset (gov. offices). Others, such as Riksdagshuset (House of Parliament), Riksbank (National Bank of Sweden), and Utrikesdepartementet (Foreign Office), are not far away. On the little is. of Riddar-

holm, which were first built on to any extent during the seventeenth century, and which are now completely covered by the many blocks of flats and offices that were built here after the coming of nineteenth-century industrialism. The turn of the century saw the development of garden suburbs like Djursholm and Saltsjöbaden, and somewhat later the municipal garden suburbs of Bromma and Brännkyrka. W. and S.W. of S., were estab. By the 1930s the inner part of the city had been completely built over, and the building of houses is now expanding rapidly in areas which only a few years ago were open country. In these new outer dists., mainly south of the city, a whole row of modern suburban communities has been estab., planned in line with up-to-date principles in units of about 20,000 to 30,000 inhab. Also outside the city are large residential areas consisting of villas and small cottages with gardens and allotments. Most of those who live in these areas have their work in the centre of the city, which has given rise to big traffic problems. Numerous large bridges and

traffic installations have therefore been built during the last decade, such as Västerbron, Tranebergbron, and Slussen. From the Old Tn. a fine old bridge leads northwards past the House of Parliament to Gustaf Adolfs Torg and the Royal Opera House. This is the beginning of Norrmalm, where most of the office buildings and banks are concentrated. Here, too, there are numerous theatres, cinemas, and restaurants. The other parts of the city have more the stamp of residential areas. This is particularly the case with Östermalm, which is bordered to the south by the cap.'s most fashionable thoroughfares, Strandvägen and Birger Jarlsgratan. The former especially is very popular with its lime-trees and proximity to the water, and leading as it does out to S.'s classical amusement centre, Djurgården, a kind of insular Bois de Boulogne. This is also where Skansen is, the world-famous open-air museum, which not only reflects the old Swedish cultural life from the country estates and farms, but is also a zoo. At Djurgården and the adjacent is. of Skeppsholmen the navy has one of its bases. Otherwise all the military cantonments have been moved out from the city, and the big training-ground N. of Östermalm known as Gärdet has been partly built over during the 1930s. Besides the ordinary elementary and secondary schools S. has numerous higher educational institutions, such as the univ., embracing all faculties except theology. S.'s inner harbour, which gives the city many of its aesthetic values, is both large and deep and is kept open all the year round, sometimes with the help of ice-breakers in the winter. In the N. part of Djurgården is Frihamnen, the Free Harbour. There is passenger traffic from S. not only to most of the Swedish coastal tns. but also to Russia, Finland, etc. Commercial traffic is world wide. The airport of S. is at Bromma, from which there are regular connections by air to nearly all the European countries, the U.S.A., Africa, and the far E. The city has many big industries such as shipbuilding, engineering, iron-founding, sugar refining, brewing, tanning, and the manuf. of silk, cotton, soap, tobacco, cork, and leather. Sev. of the world-famous names among the industries of S. are Bolinder, De Laval, Atlas-Diesel, Separator, Elektrolux, Primus, and J. M. Ericsson. Pop. (1949) 733,600.

**Stockholm Conference**, see under WORLD WAR, FIRST (1917).

**Stockholm, Treaty of**, between Sweden and Great Britain (1719), by which George I. obtained Stettin for Prussia, his ally, and Bremen and Verden for Hanover. Other treaties of Stockholm were between Sweden and Russia (1724), Sweden and Great Britain (1813), Sweden, Great Britain, and France (1855).

**Stockings**, see under Hosiery.

**Stockmar, Christian Friedrich, Baron von** (1787-1863), Ger. politician, b. at Coburg, educated at the univ. of Jena, where he devoted himself particularly to the study of medicine. In 1814 he accompanied a Saxon regiment as chief physi-

cian, and soon afterwards became one of the doctors of the hospital at Worms. S. about this time met Stein, and began to turn his attention towards politics and diplomacy. He became the confidential adviser of Leopold I. of the Belgians. In 1836 he came to England to act as adviser to the young Princess Victoria, who succeeded to the throne in the following year. S. had for a while a good deal of influence at the Eng. court. See P. Colson, *Private Portraits*, 1948.

**Stockport**, municipal and co. bor., situated on the R. Mersey, 6 m. from Manchester, England, lies partly in Lancashire and partly in Cheshire. Its position on the R. Mersey at the confluence of the Rts. Tame and Goyt gave it considerable importance in early times; it is believed to have been a Rom. and later a Saxon fortress, and in 1172 was the site of a Norman stronghold. Through S. passed the Young Pretender on his advance south and again on his retreat from Derby. S. is built on the steep sides of the Mersey valley, and in the older parts of the tn. the streets climb sharply to the more level outskirts. 'Underbank Hall,' a fine half-timbered building of the late fifteenth and early sixteenth centuries, is notable. The churches are mainly of the nineteenth century, but that of St. Mary the Virgin, which has many aniet. features, dates back to the twelfth century. The right to hold the market was granted in 1260 by Edward, the first royal earl of Chester. In St. Peter's Square stands the statue of Richard Cobden, advocate of Free Trade, who was M.P. for the tn. S. is primarily industrial, employing 40,000 workers in the many factories. Industries include cotton mills, textile, hat, glove, chemical, food, and confectionary manufs., and aircraft, automobile, electrical, and heavy engineering. Pop. 141,000.

**Stocks** (fruit). Many varieties of the larger kinds of fruit are found to be more productive when budded or grafted upon the roots of other trees, e.g. the quince stock for pears, the crab apple for standard apples. Similarly, some varieties of roses make stronger growth and live longer when grown on the briar and other S.

**Stocks**, device for the punishment of certain criminal offenders, consisted of two balks of timber so padlocked together as to imprison the feet, sometimes also the hands and even the neck, in holes made for the purpose. Stow's *Survey of London* (1598) describes them as erected in every ward of London for vagabonds and other petty offenders, while set up in the prison in Cornhill, called the cage, was a pair of S. for the punishment of night walkers. They were last used in England in the middle of the nineteenth century. In the U.S.A. they survived until before the Civil war as a punishment for slaves, but were in more general use in the eighteenth century. See PILORY.

**Stocksbridge**, tn. in the W. Riding of Yorkshire, 9½ m. N.W. of Sheffield. It manufs. alloy, stainless and other special steels, also vehicle springs and umbrella frames. It is situated close to the proposed Peak Dist. National Park. Pop. 10,300.

**Stockton**, co. seat of San Joaquin co., California, U.S.A., 70 m. E.N.E. of San Francisco, on an arm of the San Joaquin R. Its chief industries are the manuf. of agric. and mining implements, leather, lumber products, flour, soap, and iron goods, and there is trade in the fruit, cattle, and grain of the rich San Joaquin valley, loaded from an 18 m. long waterfront. Pop. 54,700.

**Stockton-on-Tees**, municipal bor. mkt. tn. and port of co. Durham, England, 5 m. from the mouth of the R. Tees, and 19 m. S.S.E. of Durham. The tn. is believed to have received its charter of incorporation as a bor. between the years 1201 and 1208, and its first market charter was granted in 1310. The chief buildings of interest are the par. church, the tn. hall (1735), the first railway ticket office, and sites connected with the first passenger railway from S. to Darlington (see STEPHENSON, GEORGE). In the High Street, one of the widest in England, are held the bi-weekly markets. John Walker, inventor of the first friction match, and Thomas Sheraton, the famous designer and maker of furniture, were born here. In addition to the old estab. heavy industries of iron, steel, chemicals, and engineering, many new industries have been attracted to the bor. These include light engineering, dressmaking, shirtmaking, hollow-ware, telephone equipment, light castings, woollen spinning, bicycles, plywood products, and distributive trades. The quay is being extended and a new warehouse erected to extend the use of the tn. as a distributive centre. S. is a par. bor. returning one member. Area of bor. 5561 ac. Pop. (estimated) 73,400.

**Stockton, South**, see THORNABY-ON-TEES.

**Stockwell**, dist. situated in the bor. of Lambeth, S. London, the site of Spurgeon's orphanage, founded in 1867.

**Stoics**, name for the sect of anc. moralists opposed to the Epicureans in their views of human life. The founder of the system was Zeno (c. 310-270 B.C.) of Citium in Cyprus and probably of Semitic origin who derived his first impulse from Crates the Cynic. He opened his school in a building or porch, called the Stoa Poecile (Painted Porch), at Athens, whence the name of the sect. Zeno and his successors, *Cleanthus* and *Chrysippus*, represent the first period of the system. The second period (200-50 B.C.) embraces its general promulgation and its introduction to the Romans.

The third period of Stoicism is Roman. In this period we have Cato the younger, who invited to his house the philosopher Athenodorus, and, under the empire, the three Stoic philosophers whose writings have come down to us—Seneca, Epictetus, who began life as a slave, and the Emperor Marcus Aurelius Antoninus. Stoicism prevailed widely in the Roman world, although not to the exclusion of Epicurean views; indeed, both these main philosophical currents of the period have directly in view the same practical end, namely, that if there were any good

attainable at all, it must be found by each man within himself, and whatever of theoretical interest was implied in either philosophy was subordinate to that end; and, again, although they might be reached by widely divergent roads, there was, superficially at least, a close resemblance between the characteristic *apatheia* (freedom from emotion) of the S. and the *ataraxia* (imperturbability) of the Epicureans. The Moral system is best considered under four heads: the Theology, the Psychology or theory of mind, the theory of the Good or human happiness, and the scheme of Virtue or Duty. (1) The S. held that the universe is governed by one good and wise God, together with inferior or subordinate deities. (God exercises a moral government; under it the good are happy, while misfortunes happen to the wicked. They did not admit that the Deity intermeddled in the smaller minutiae; they allowed that omens and oracles might be accepted as signs of the foreordained arrangement of God. Like most other anc. schools, the S. held God to be corporeal like man; body is the only substance; nothing incorporeal could act on what is corporeal; the First Cause of all, God or Zeus, is the primeval fire, emanating from which is the soul of man in the form of a warm ether. (2) Next, as to the constitution of the mind. We have bodies like animals, but reason or intelligence like the gods. Animals have instinctive principles of action; man alone has a rational, intelligent soul. According to Antoninus we come into contact with Deity by our intellectual part, and our highest life is thus the divine life. But the most important Stoic doctrine respecting the nature of man is the recognition of Reason as a superior power or faculty that subordinates all the rest, the governing intelligence. (3) The Stoic Theory of Happiness, or rather of the Good, was not identified with happiness. The S. began by asserting that happiness is not necessary, and may be dispensed with, and that pain is no evil, a doctrine which, if followed consistently, would dispense with all morality and human endeavour. They disallowed the direct and ostensible pursuit of pleasure as an end (the point of view of Epicurus), but allured their followers partly by promising them the victory over pain, and partly by certain enjoyments of an elevated cast that grew out of their plan of life. Next to the discipline of endurance we must rank the complacent sentiment of Pride, which the Stoic might justly feel in his conquest of himself, and in his lofty independence and superiority to the casualties of life. The last and most elevated form of Stoic happiness was the satisfaction of contemplating the Universe and God. (4) The Stoic theory of Virtue is implicated in the ideas of the Good now described. The S. were the first to preach what is called 'Cosmopolitanism'. They said: 'There is no difference between Greeks and barbarians; the world is our city.' Seneca urges kindness to slaves, for 'are they not men like ourselves, breathing the same air, living and dying like ourselves?' The

Epicureans declined, as much as possible, interference in public affairs, but the Stoic philosophers all urged men to the duties of active citizenship and were the first who pronounced positive beneficence a virtue. They adopted the 'four Cardinal Virtues' (Wisdom, or the Knowledge of Good and Evil; Justice; Fortitude; Temperance) as part of their plan of the virtuous life, the life according to nature. Justice, as the social virtue, was placed above all the rest. But most interesting to us are the indications of the idea of Beneficence. Epictetus is earnest in his exhortations to forgiveness of injuries. Antoninus often enforces the same virtue, and suggests considerations in aid of the practice of it; he contends as strongly as Butler and Hume for the existence of a principle of pure, that is, unselfish, benevolence in the mind, in other words, that we are made to advance each other's happiness. There is also in the Stoic system a recognition of duties to God, and of morality as based on piety. Not only are we all brethren, but also the 'children of one Father.' The extraordinary stress put upon human nature by the full Stoic ideal of submerging self in the larger interests of being led to various compromises. The rigid following out of the ideal issued in one of the Paradoxes, namely that all the actions of the Wise Man are equally perfect, and that, short of the standard of perfection, all faults and vices are equal. This has a meaning only when we draw a line between spirituality and morality, and treat the last as worthless in comparison with the first. The later S., however, in their exhortations to special branches of duty, gave a positive value to practical virtue, irrespective of the ideal. The idea of duty was of Stoic origin, fostered and developed by the Rom. spirit and legislation. The early S. had two different words for the 'suitable' (*καθῆκον*) and the 'right' (*καρποφωρα*). It was a point with the S. to be conscious of 'advance,' or improvement. By self-examination he kept himself constantly acquainted with his moral state, and it was both his duty and his satisfaction to be approaching to the ideal of the perfect man. When renouncing the position of 'wise,' he yet claimed to be advancing. This idea, familiar to the modern world, was unknown to the anc. before the S. It is illustrative of the unguarded points and contradictions of Stoicism, that contentment and apathy were not to permit grief even for the loss of friends. Seneca, on one occasion, admits that he was betrayed by human weakness on this point. The chief anc. authorities on the S. are the writings of Epictetus, Marcus Antoninus, and Seneca, themselves Stoic philosophers, together with notices occurring in Cicero, Plutarch, Sextus Empiricus, Diogenes Laertius, and Stobaeus. See also R. D. Hicks, *Stoic and Epicurean*, 1910; E. V. Arnold, *Roman Stoicism*, 1911; R. M. Wenley, *Stoicism and its Influence*, 1925; besides works on philosophy in general which provide a summary on Stoicism, such as W. Durant, *The Story of Philosophy*, 1946.

**Stoke Newington**, metropolitan bor. of

N. London, with reservoirs and water-works. With Hackney it returns one member to Parliament. Pop. 49,500.

**Stoke Poges**, vil. of Buckinghamshire, England, 2 m. N. of Slough. The church of St. Giles is part Norman and part Early Eng. It is the burial place of Gray, the churchyard being identified with the scene of his *Elegy*. A field adjoining the churchyard, and a monument to the poet, were acquired by the National Trust in 1922 and 1925. Pop. 1700.

**Stokes, Sir George Gabriel** (1819-1903), Brit. mathematician and physicist, b. in Skreen, co. Sligo, Ireland, and educated at Bristol and Pembroke College, Cambridge, where he was appointed Lucasian prof. of mathematics in 1849. He was secretary (1854-85), and president (1885-90) of the Royal Society, and fellow (1841-1857), and master (1902) of his college. He represented Cambridge in Parliament from 1886. He discovered the nature of fluorescence, made important discoveries in the theory of light-absorption, the ultra-violet spectrum, and the ether theory of light; did fundamental work in hydrodynamics, and made important contributions in mathematics. His works include *Mathematical and Physical Papers* (ed. Sir J. Larmor, 1880-1903); *On Light* (1881-87) and *Memoirs and Scientific Correspondence* (ed. Sir J. Larmor, 1907).

**Stokesay**, vil. of Shropshire, England, 6½ m. N.W. of Ludlow. There is a seventeenth-century church with a roofed memorial pew, and a thirteenth-century moated castle, an excellent example of its kind. Pop. 1109. See House.

**Stokesley**, mkt. tn. of the N. Riding of Yorkshire, England, 16 m. S.E. of Stockton-on-Tees. There is an endowed school. Ironstone mines are near by. Pop. 1700.

**Stoke-upon-Trent**, municipal, co., and parl. bor. and city of Staffordshire, England, 14½ m. N. of Stafford on the Trent and Mersey Canal. It includes the six tns. of Burslem, Hanley, Longton, Fenton, Tunstall, and S.-upon-T., which were incorporated in the co. bor. of S.-upon-T. in 1910. City status was granted in 1925. Educational institutions include the N. Staffordshire Technical College (world famous for its pottery classes), and the city has taken a leading part in establishing the new univ. college of Staffordshire. The chief hospital is the N. Staffordshire Royal Infirmary. S.-upon-T. is famous for the manuf. of pottery and porcelain, often being referred to as 'The Potteries.' Other major industries are coal-mining, iron and steel production, and rubber tyre manuf. A considerable number of light engineering works are allied to these major industries. During the Second World War bombs fell in the city area on some thirty occasions, but the damage sustained was relatively small. Three members are returned to Parliament. Pop. 274,300.

**Stokowski, Leopold Antoni Stanislaw Boleslawowicz** (b. 1882), Amer. conductor, b. in London, of Polish parentage. In 1912 he was appointed to Philadelphia



Symphony Orchestra, which under his leadership became unexcelled for ensemble playing and beauty of tone.

**Stolberg, Christian, Count** (1748-1821) and **Stolberg, Friedrich Leopold, Count** (1750-1819). Ger. poets. Christian was b. at Hamburg and his brother at Bramstedt in Holstein. Both were members of the famous Göttingen Hainbund, of which Bürger (*q.v.*) and Voss were also members. They collaborated in *Gedichte* (a vol. of poems ed. by H. C. Boie in 1779); *Schauspielen mit Chören* (1787), designed to roawaken interest in (Gk. drama; and some patriotic poems, *Vaterländische Gedichte* (pub. posthumously, 1825). Christian also wrote *Gedichte aus den Griechischen* (1782), *Die Weisse Frau* (a ballad, 1814), and a trans. of Sophocles (1782); and Leopold, who was the better poet of the two, *Timoleon* (a tragedy, 1784); translations of the *Iliad* (1778), of Plato (1796-97), Æschylus (1802), and *Ossian* (1806); a novel, *Die Insel* (1788); *Geschichte der Religion Jean Christi* (1806-1818); and a life of Alfred the Great (1815). Their works were pub. collectively (1820-1825). See study by J. Jansen, 1877-82, 1910.

**Stolberg**, tn. in Rhineland (N. Rhine-Westphalia), Germany, 5½ m. S.E. of Aachen, on the railway line to Cologne. It manufs. zinc, lead, brass, soap, needles, and press-studs. Pop. 31,500.

**Stolen Goods.** Possession of S. G. recently after their loss is *prima facie* evidence that the person in possession stole the goods or received them knowing them to have been stolen; but if many months have elapsed between the loss and the discovery the possessor cannot in the absence of any other circumstances implicating him with the theft be called upon to account for the manner in which he came by the goods. This is the doctrine of *Recent Possession*.

Conviction on indictment for theft entails restitution of the S. G. to the rightful owner. But if the S. consist of some valuable security or negotiable instrument (*q.v.*) which after the theft has been *bona fide* paid by some person who has rendered himself liable to discharge such security or instrument, the court will not order restitution (see also *UNDER MARKET OVERT*). Goods obtained by fraud or other unlawful means not amounting to larceny (*q.v.*) and transferred to some bona fide purchaser will not be restored to the defrauded owner (Sale of Goods Act, 1893). Where S. G. have been sold by the thief to a bona fide purchaser the court has power to make an order, on the restitution of the goods to the owner, that out of any money found on the thief on his arrest a sum not exceeding the amount of the proceeds of the sale be paid over to the purchaser. Magistrates in the exercise of their summary jurisdiction also have power to order restitution. If S. G. have been pawned, they will, generally speaking, only be ordered to be restored to the true owner if the amount lent by the pawnbroker was not over £10. See also RECEIVING STOLEN GOODS; SEARCH WARRANT.

**Stolp**, see SLUPSK.

**Stomach**, pear-shaped digestive sac which in man is situated in the upper part of the abdomen, the wider end to the left, the narrower to the right, but with its centre somewhat to the left of the median line. It is entered by the oesophagus at the *cardiac orifice*, where the circular muscle is thickened to form a sphincter. The opening of the S. into the intestine is called the *pylorus*. The innermost coat of the S. consists of mucous membrane made up of a layer of epithelial cells resting on connective tissue. When the organ is not fully distended, the mucous membrane is thrown into folds called *rugæ*; when the S. is distended the rugæ disappear. Outside the submucous coat of connective tissue are the submucous coat of connective tissue and three coats of unstriated muscle, of which the inner is oblique, the next circular, and the outer longitudinal. The whole of the organ is embraced by the two layers of the *peritoneum*, the serous membrane which lines the interior of the abdominal cavity. The mucous coat contains gastric glands which secrete gastric juice and mucus. Entering the S. by the cardiac orifice, the food is acted upon by the gastric juice, which contains hydrochloric acid and enzymes called pepsin and rennin. The juice is effectively mixed with the salivated food by the movements of the muscular walls of the S., the degree of distension of the sac being just sufficient to accommodate the contents. When the food is rendered acid by the action of the gastric juice and has been propelled by peristalsis to the pyloric canal, the pylorus opens to admit the food to the small intestine. The effect of digestion in the S. is to convert proteins into peptones. The gastric juice has also some bactericidal influence.

*Gastritis* is inflammation of the coats of the S. *Acute gastritis* may be set up by a corrosive poison, by the effects of acute fevers as typhus and diphtheria, or by unsuitable food. The flow of gastric juice is arrested, digestion is stopped, and anti-peristalsis may occur, leading to vomiting. The attack tends to subside when the exciting cause is removed, and treatment should be directed to this end. In the case of poisoning emetics should be used, but the administration of a purgative is less distressing when the irritating substance is indigested food material. Bismuth and restriction to a light diet are of help in soothing the irritated membrane. *Chronic gastritis* or *gastric catarrh* may follow from repeated acute attacks, and is especially associated with the alcoholic habit. The coats of the S. are in a state of chronic congestion, the mucous membrane and in some cases the muscular coat become thickened. The activity of the glands is lessened and the patient becomes a chronic dyspeptic. Treatment requires patience and perseverance in the subject. If alcohol is the predisposing cause, it should be abandoned, and the diet should be carefully restricted for a protracted period. Bismuth and arsenic are useful in allaying

irritation, and peptonised foods help to supply the deficiency in the glands.

**Gastric ulcer** is commonest in females of an anæmic tendency. It is caused by the S. digesting a part of its own tissue in which the blood supply is deficient. The ulcer or ulcers usually occur toward the pyloric end, are small and circumscribed, but may tend to eat right through the S. wall, when a fatal ending can hardly be averted. The most characteristic symptoms are severe pain and vomiting immediately after food. The best treatment is absolute rest combined with a milk diet, when the condition may cure itself. Copious hæmorrhage, indicating the danger of perforation at an early period, should be met by prompt surgical measures. If perforation has taken place, immediate suturing of the opening and cleansing of the abdominal cavity may lead to recovery.

**Cancer (Carcinoma) of the stomach** may follow chronic gastric ulcer and usually occurs at the pyloric end. Unfortunately the condition is generally not recognised till too late for surgical measures to be of any avail, though partial or complete excision of the S. (gastrectomy, *q.v.*) can be performed if the disease is not too far advanced. The concentration of hydrochloric acid in the gastric juice is lowered, whereas in gastric ulcer it is raised.

**Pyloric stenosis** is a stricture of the pyloric sphincter muscle. In infants it is caused by a congenital thickening of the muscle; in adults it may be due to the scars left by ulcers.

**Stone, Nicholas** (1586-1647). Eng. sculptor, b. at Woodsbury, near Exeter. He lived three years in London, and then went to Holland, where he worked for Peter de Keyser. In 1619 he was appointed master-mason for building the new banqueting-house of Whitehall, and in 1626 was appointed master-mason of Windsor Castle. He made sev. monuments for Westminster Abbey; among them one to Spenser. S. had three sons: Henry, Nicholas, and John. **Henry S.** (d. 1653) was a statuary and painter. He studied in Italy and the Netherlands, and made many excellent copies of celebrated It. and Flem. pictures. There is a large copy at Hampton Court of the celebrated picture, by Titian, of the Cornaro family. **Nicholas S.** (d. 1647), the second son, who was a statuary, also studied abroad, and modelled many excellent copies of celebrated works.

**Stone**: 1. Urb. dist. and mkt. tn of Staffordshire, England, on the Trent, 7 m. N. of Stafford. There is a priory, and a grammar school estab. in 1558. Brewing, ceramics, and the manuf. of glass and footwear are carried on. Pop. 8500. 2. Vil. of Kent, England, 4 m. W. of Gravesend, on the Thames. Cement manuf. is the chief industry. The historic church of St. Mary overlooks the riv. Pop. 7000.

**Stone** (for the chief types of S. used in architecture see BUILDING STONES; for dressing S. see MASONRY). **Preservation**: The durability of S. depends on good selec-

tion of the S. at the quarry, weathered (or inclined) top surfaces, correct fixing, and efficient damp-proof courses. External paints and chemicals are not usually very effective in preventing decay. Where the S. has decayed it can be cut out and replaced by a cement mixture, though it is usually better to use pieces of new S. of the same kind. Artificial S. and terra-cotta are often used as a substitute for natural S. Terra-cotta is a special form of burnt clay, whereas artificial S. is a precast concrete. Cast S. is a superior kind of artificial S. which has a face of crushed natural stone and Portland cement over a core of ordinary concrete.

**Stone**, riv. of Tennessee, U.S.A., joining the R. Cumberland above Nashville, after a north-westerly course. It was the scene of a Federal victory in the Amer. Civil war (Dec. 31, 1862 Jan. 2, 1863), the battle being sometimes called Murfreesboro.

**Stone**, in medicine, see CALCULUS. GALLSTONES; LITHOTOMY.

**Stone**, standard Brit. weight, called the imperial S., is 14 lb. Other Ss. in use are 8 lb. for meat, 24 lb. for wool, 16 lb. for cheese, 5 lb. for glass, and 32 lb. for hemp.

**Stone Age**. The hist. of man's gradual advancement is best understood by its relation to the three technological stages in his development, in the first of which he used stone tools and weapons (see also IRON AGE). The S. A. has been divided into the Old S. A., when stone implements were merely flipped into shape, and the New S. A. when implements of stone were ground and polished. Lord Avebury suggested the terms Palæolithic and Neolithic for these divs., and a Mesolithic phase has been added to bridge the period between the S. A. and the Metal Age. It should be noted that the S. A. can be considered from a chronological and cultural point of view; the three technological stages, however, and in particular the S. A., were not everywhere contemporary. Recent research has been largely directed towards the relationship of the Palæolithic S. A. to geochronology and to the elucidation of an absolute chronology based upon geology; while the functional-economic stages of the Neolithic have attracted as much attention as the typology of its implements and pottery, and the study of megalithic graves.

Palæolithic men were hunters, and their remains have been found in the caves in which they lived, and in the sedimentary deposits of riv. gravels. The *Early Palæolithic* is divided into the cultures of Chelles and St. Acheul. (The various cultures are known by continental names as Fr. and Belgian workers were the first in this systematised study.) Its prin. deposits belong to the Riss-Wurm interglacial period, when the warm fauna included *Elephas antiquus*, a rhinoceros, and *Hippopotamus major*. Probably the Sussex Piltdown Man belongs to this period. The Middle Palæolithic is characterised by the Mousterian flake industry, and in geological time its spread is in the period of the Würm advance. Neanderthal man lived in a cold fauna which

included the mammoth, horse, ox, and reindeer. The Upper Palaeolithic has the cultures named Aurignacian, Solutrean, and Magdalenian, and in geological time it covered the retreat of the Wurm glaciation and a dry and rather cold subsequent period. There was a steppe fauna which with the onset of colder conditions became a tundra fauna. Sev. varieties of *homo sapiens* appear.

The walls of certain caves lived in by Palaeolithic man were decorated with sketches and paintings of magic and religious significance. This remarkable practice is often found in the Magdalenian culture of S.W. France and N.W. Spain, and its association with the reindeer hunt is unmistakable. In 1940 were found a series of paintings in a cave at Lascaux (q.v.), near Montignac on the Vézère, a trib. of the Dordogne, which belong to the Aurignacian. No cave art has been recorded in Britain.

There are sev. distinct cultures in the Mesolithic period, all of them based on a food-gathering economy. The climate had much improved, and hunting and fishing are well represented by the presence of microliths and fish-spear barbs. In Britain there seem to be four elements, one of which has affinities with the Baltic.

The New S. A. (Neolithic) saw a higher civilisation based upon agriculture and stock-raising; there was a wide trade in flint, which was mined; and the period is also marked by the spread of megalithic tombs (see MEGALITH CULTURE), and the construction of earthwork camps with causeways or interrupted ditches. There is a distinctive kind of domestic pottery which is ultimately based upon vessels of leather and skin, and plants both cereal and textile. Sheep, oxen, goats, and swine were domesticated. It should be noted that sev. varieties of polished stone implements (axes, knives, daggers, and tanged and barbed arrow-heads) really belong to the succeeding Metal Age.

*The Stone Age in Britain.*—The interdependence of the various palaeolithic cultures and the glaciations has been well studied, and the correlation between the cultures and glacial deposits has been demonstrated in the lower and upper Thames, in the Cromer dist., and at Hoxne and elsewhere in Suffolk. In E. Anglia deposits of late Tertiary age have yielded colthts, the first tools of man or some manlike creature; the best examples are in Ipswich Museum. Upper Palaeolithic cave-dwellings have been recorded at Creswell Crags, Kent's Cavern, Torquay; Cheddar Cave, Somersetshire; and at Paviland in S. Wales. The Mesolithic period is well represented by discoveries of pygmy flints in the Lower Greensand area of the weald of Kent and Sussex; in the Lincolnshire fens; and in the Pennines. Characteristic pottery of the Neolithic period has been recovered from Windmill Hill near Avebury, Wiltshire, and from Peterborough, and these two places give their name to two important varieties, the study of which has done much to throw light on the cultural groups in Britain. Examples of Neolithic

fortified earthwork camps which have been scientifically examined in recent years include Abingdon, Berkshire; the Trundle, and Whitehawk Hill, Sussex; Knap Hill and Windmill Hill, Wiltshire. In each, except Abingdon, the fort is on a hill top, and it always consists of a complex of concentric, flat-bottomed ditches interrupted at frequent intervals by causeways, and within the ditch a small earthen rampart. For megalithic monuments see MEGALITH CULTURE.

See H. Peake and H. J. Fleure, *Ages and Men*, 1927, and *Hunters and Artists*, 1927; M. C. Burkitt, *Our Early Ancestors*, 1929, and *The Old Stone Age*, 1933; and V. G. Childe, *Man Makes Himself*, 1936.

**Stone Carving.** Sculpture in hard material, stone or wood, differs from sculpture in plastic material, clay. The former is a paring down of material, the latter a building up. Both, however, are drawing in material and both depend on a realisation of form. The greatest S. C. is that in which the sculptor worked direct, sensing the form in the block of stone and making it grow out of the material as he carved it. S. C. in the hist. of art preceded painting. Primitive man carved the bones of animals on the rock walls of caves, usually in relief. For sculpture in the round see more particularly SCULPTURE. In Egypt gigantic figures were carved from stones placed together for the purpose. In Assyria, Babylonia, and Mesopotamia walls were carved with sculpture. The annual reliefs in stone of the Assyrians show the influence of early Babylonian seal cutting. Wonderful examples of S. C. are to be found in India. Elephant forms were carved out of great rocks, and grottoes and temples were hewn out of rock faces. Flower and leaf forms were carved in and about the supporting pillars. The use the Gks. made of S. C. is well known, and the beauty of the Parthenon frieze has never been surpassed. In central America Maya S. C. shows that blocks of stone elaborately carved were placed one upon the other to form temples and buildings. These carvings, as in most decorative carvings, were in relief. Gigantic stone pillars, carved in relief, called *stelae* after Gk. examples of this kind of work, are the characteristic forms of Mayan S. C. S. C. of elaborate and formal design is to be found in the great cathedrals of the Middle Ages. Columns were intricately carved and the stone supporting pillars were shaped and carved at base and capital. Images of saints, to fill the niches, effigies and heraldic beasts on tombs, gargoyles, screens, and altarpieces all supplied work for the medieval stone carver, who was the craftsman, but not always the designer. There has been a decline of the medieval tradition of architectural S. C. since the industrial revolution, and outstanding examples of S. C. on modern buildings and churches are becoming increasingly rare. It was Eric Gill (q.v.) above all modern artists who led the way to revival of architectural and especially religious S. C., executed as well as designed by the sculptor. A large number of modern sculptors, including

Jacob Epstein and Henry Moore, have since devoted themselves to 'direct' S. C. For stones used in carving see SCULPTURE. Concrete is a medium which may be used plastically in a mould, or it may be carved like stone. See J. C. Rich, *The Methods and Materials of Sculpture*, 1948.

**Stonechat** (*Saxicola torquata*), small bird of the thrush tribe. The male bird has a black head and throat, dark back, and tawny breast, and the female differs from it in that its head is brown. It is frequently seen in Britain, and occurs in Europe and Asia.

**Stone Circles**, see CIRCLES OF STONE.

**Stone Coal**, see ANTHRACITE.

**Stonecrop**, see SEDUM.

**Stone-fly**, name given to any of the orthopterous insects of the order Plecoptera. The species are of wide distribution

and it has in this sense been compared with the architectural development of a cathedral.

The monument is enclosed within a low earthwork circle having a bank inside the shallow ditch, and a single entrance fronted by the Avenue, an earthwork of parallel banks and ditches about 70 ft. apart. Part of the course of the Avenue has been recovered by aerial photography, thus confirming statements made by Wm. Stukeley; after leaving S. it continues in its straight course for 600 yds. and then divides, one branch curving N., and the other E. to the Avon at W. Amesbury. Within the earthwork circle is a circle of holes, probably for wooden posts, about 288 ft. in diameter; they were first discovered by John Aubrey in 1666, and are known as the Aubrey Holes. The Aubrey



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#### STONEHENGE

and are frequently found near running streams. The larva are deposited in water, and are usually found under stones.

**Stoneham**, tn. in Middlesex co., Massachusetts, U.S.A., 9 m. N. of Boston. Its chief monu. are boats, automobiles, and chemicals. Pop. 10,800.

**Stonehaven, Stanhive, or Kilwhane**, burgh, seaport, seaside resort, and co. tn. of Kincardineshire, Scotland, on Stonehaven Bay, 15 m. S. of Aberdeen and 23 m. N.N.E. of Montrose. The ruins of Dunnottar Castle are in the vicinity. It has a secure harbour, a small fishery, distilleries, and tanneries. Nets and toys are also made. Pop. 4,500.

**Stonehenge** (from the O.E. *hengen*, that which is hung up, the reference being to the horizontal lintel stones), perhaps the most famous prehistoric monument in Britain, is a great circle of standing stones on Salisbury Plain, 2 m. W. of Amesbury, Wiltshire. It has attracted the attention of antiquaries for many centuries, and in spite of scientific excavation in recent years, it still remains a major archaeological mystery. It is obviously a sacred site and devoted to worship; its structure has been proved to be not all of one date,

Circle, which dates from the Beaker period of the Bronze Age, was the earliest structure at S. After its decay there was erected a ring of standing sarsen stones connected by continuous lintels, the largest stone in the circle being 29 ft. 8 in. in height. Within it was built a horseshoe structure of five trilithons of sarsen stone. All the sarsen stones are carefully dressed, and the vertical stones have tenons made to fit mortice holes on the under sides of the lintels, which are curved to meet the circumference of the circle and the whole corrected for perspective. Of this period seems to be the Altar Stone, a prostrate slab of micaceous sandstone, and both this and the Heel Stone in the Avenue are on the axis of the Avenue. There is also an inner horseshoe of trilithons made from spotted dolerite, a stone which has been transported from the Prescelly Mts. in Pembrokeshire. One of these 'bluestones' at least has been used before in another henge structure, and there is good evidence at S. that the 'bluestones' were put up in their present positions after the sarsens. The structural story of the monument is completed by the Y and Z Holes, two irregular

incomplete circles, in the square socket holes of which has been found pottery of the Early Iron Age. These rings of socket holes lie between the sarsen circle and the Aubrey Circle. S. Down, which contains many barrows and other prehistoric remains, including the Avenue and the Cursus, was purchased by public subscription in 1927 and 1929, and vested in the National Trust in order to preserve the view from S., which itself was a gift to the nation, and is in the custody of the Ministry of Works.

**Woodhenge**, 2 m. north-east of S., was a timber monument, the post holes of which were first noticed on an air photograph. Its excavation suggested that it may have been a timber prototype of S. There were six concentric rings of posts within a bank and ditch, interrupted by a causeway, and on the central axis, which, as at S., pointed towards the mid-summer sunrise, was the dedication sacrifice of a child whose skull had been cleft. At *Archbury* (q.v.) east of S. is a remarkably imposing monument which in its development is perhaps more interesting than S. At its first period it consisted of three circles of large sarsens with an Avenue, the stones of which are curved with male and female symbols. At a later period it was surrounded by a huge ditch as much as 30 ft. deep, and an upcast bank. The monument is in the custody of the Ministry of Works, and the National Trust owns surrounding property. See *Excavation Reports in Antiquaries Journal*, vols. i-vii., 1921-27; R. S. Newall, *Antiquity*, 1929, 75-88; F. Stevens, *Stonehenge To-day and Yesterday* (H.M.S.O.), 1938. For a bibliography of more than 1000 items, see *Wiltshire Archaeological Magazine*, special part of vol. xxxii.

**Stonehouse**: 1. Or **East Stonehouse**, since 1914 a part of Plymouth, in Devonshire, England, situated between Devonport and Plymouth, with which it formed the 'Three Towns.' 2. Par. of Gloucestershire, England, 3 m. W. of Stroud. S. was once a centre of the cloth-making industry, but this has largely died out. The manu. of bricks is carried on. Wycliffe College, the public school, is situated here. Pop. (estimated) 3000. 3. Par. and tn. of Lanarkshire, Scotland, 7 m. S.E. of Hamilton, on Avon Water. Coal-mining and textile manu. are carried on. The countryside around S. is noted for its charm. The Reformation martyr Patrick Hamilton was b. in S. Pop. 3900.

**Stone Loach** (*Nemachilus barbatulus*), small Brit. fish, frequents clear shallow streams, living entirely on animal diet. Its length never exceeds 5 in., but the flesh is very delicate. It has six sensitive barbules hanging from the upper lip.

**Stones, Precious**, see GEM; and separate articles DIAMOND; EMERALD; etc.

**Stones, Standing**, see CIRCLES OF STONES.

**'Stonewall' Jackson**, see JACKSON, THOMAS JONATHAN.

**Stoneware**, see POTTERY.

**Stonework**, see MASONRY.

**Stone Worship**, see FETISHISM, and IDOLATRY.

**Stonington**, seaside resort of Connecticut, U.S.A., in New London co., situated on Long Is. Sound, 40 m. S.W. of Providence. Pop. 2000.

**Stonyhurst**, Rom. Catholic public school, 4 m. S.W. of Clitheroe in Lancashire, England. It had its origin in the College of St. Omer, founded in France in 1592. The members of the latter took refuge in Bruges and in Liège during the eighteenth century, after the suppression of the college in France, and in 1794 moved to the house of a Lancashire squire at S. There is accommodation for some 400 boys.

**Stony Stratford**, mkt. tn. of Buckinghamshire, England, on Watling Street and the R. Ouse, 8 m. N.E. of Buckingham. It has engineering works. Pop. 2500.

**Stool of Repentance**, seat or pew in churches in Scotland, upon which persons who had come under the censure of the eccles. authorities for some sin, such as drunkenness or lying, were made to stand.

**Stools**, evacuations from the bowels. Normally they consist of undigested food, digestive juices not absorbed, fragments of epithelium, etc. In disease of the alimentary canal they often give valuable diagnostic indications, through the presence of blood, mucus, casts, parasites, bacteria, etc. Constriction of the intestine is sometimes shown by small, round masses, called sheep-dung S. Lead-pencil S., or faeces of small diameter, are not necessarily indicative of intestinal stricture.

**Stopping**, see under MINING.

**Stop-order**. The effect of obtaining a S. on a fund in court is to stop the payment out to any person other than he who has obtained the S. Ordinarily the assignee of a chose in action (q.v.) must give notice (see NOTICE) to the legal holder in order to perfect his title as against third persons who may have charges on the same property; but when the chose in action is in court a S. is required in lieu of a notice.

**Stoppage in Transitu**, right conferred on the unpaid vendor of goods who has parted with the goods to stop them on the insolvency of the buyer, before they have reached the latter's actual or constructive possession, and to resume possession until they are paid for. S. in T. differs from lien (q.v.) in two respects: it can be exercised only when the buyer is insolvent and only when the goods have left the possession of the seller. The effect of S. in T. is not to rescind the sale, and, indeed, the buyer can recover damages if the vendor resells when he ought not. But in some cases the vendor may at once resell against the buyer: (1) where the goods are perishable; (2) where the right of resale was expressly reserved in the contract of sale. Apart from these cases the seller must give notice of his intention to resell, and also give the buyer a reasonable opportunity to pay or tender (q.v.) the price.

**Stops**, see PHONETICS.

**Storage Batteries**, see ACCUMULATOR.

**Storage, Cold**, see REFRIGERATION.

**Store, Bill of**, see BILL OF STORE.

**Storehammer**, see HAMAR.

**Stork** (*Ciconia*), family of wading birds with long conical bills, long three-toed legs, and large wings. The white or house S. (*C. alba*) was formerly plentiful in Britain, but is now only an occasional visitor. It is widely distributed on the Continent, in many parts of which it is strictly protected for its service in destroying reptiles, small mammals, and insects, and in devouring offal. Its great, clumsy nest is often to be seen on a house top or church spire. Its plumage is greyish white, its quills and longest feathers on the wing coverts black, and the beak and legs red. It migrates to Africa in winter. The black S. (*C. nigra*) has the upper surface black and the lower parts white. This species also is protected, and, during migration, occasionally strays to Britain. It is widely found in south and central Europe, Asia, and parts of Africa. The adjutant, ibis, heron, and spoonbill are related types.

**Storm, Theodor Woldsen** (1817-88), Ger. poet and novelist, b. at Husum, Schleswig. He studied law at Kiel and Berlin, and spent the greater part of his life as magistrate and judge in the service of Schleswig-Holstein and Prussia. First became known as a lyric poet by his *Gedichte* (1852), and his first novel was *Immensee* (1852), which gained him general recognition, and was followed by numerous other short stories, including *Psyche* (1875), *Hans und Heinz Karsch* (1882); *Der Schimmelreiter* (1888), etc. A sense of melancholy pervades many of his poems, which treat of childhood, family, love, and death. It occurs also in his novels, the earlier often romantic, the later true masterpieces of realism and feeling for tragedy. Three of his stories were pub. as *Drei Noellen* (ed. by Dr. P. Vrijdaghs and W. Rupman, 1932). His collected works were pub. 1868-77. See lives and studies by Gertrud Storm, 1911-12; H. Jess, 1917; A. Biese, 1921; E. Steiner, 1921; P. Schütze (4th ed. 1925); F. Stuckert, 1940; and K. Röll, 1940.

**Storm**, wind of force 11 on the Beaufort wind scale, i.e. between 64 and 75 m.p.h., during which in the days of sailing vessels a man-of-war could only carry S. stay-sails. Commonly S. is also used, if less rigidly, to describe any violent atmospheric commotion, such as a violent gale, line-squall, rainstorm, snowstorm, hailstorm, duststorm. See CYCLONE; HURRICANE; RAIN; THUNDERSTORM; TORNADO; TYPHOON; WIND.

**Storm Troops** (*Sturmabteilung*), see S. A. AND S. S.

**Storm Warnings**, see WEATHER FORECAST.

**Stornoway** (*Stjørna's Vagr or Bay*), seaport and police burgh of Lewis Is. (E. coast), Outer Hebrides, Ross-shire, Scotland, on S. Harbour, 180 m. N.W. of Oban. It was made a burgh of barony by James VI. It is the chief tn. in the Western Isles, and an important fishing centre, especially for herrings. Pop. 4700 (nearly doubled in the fishing season).

**Storting** (Old Norse, *stor*, great; *ting*, assembly), national Parliament of Nor-

way, the 150 representatives of which are elected every fourth year by adult suffrage (of twenty-three years of age). The S. is convened every year *suo jure*, and not by any royal writ or writ of the executive, and is divided into a Lagting or Upper House, composed of one-fourth of the members, and an Odelsting or Lower House, composed of the remainder. Legislative power is vested in the S. The royal veto may be exercised twice, but if a Bill passes three S. formed by separate and subsequent elections, it becomes law automatically. Questions relating to laws must be considered by each section separately, and all new laws must first be laid before the Odelsting, from which they pass to the Lagting for acceptance or rejection. If the sections cannot agree they hold a joint session and the final decision must be by a two-thirds majority.

**Story, Short**, see SHORT STORY.

**Stoughton**, tn. of Norfolk co., Massachusetts, U.S.A., 18 m. W. of Boston. Manufs. include cardigan jackets, boots, shoes, and rubber. Pop. (1910) 8700.

**Stour**, name of sev. Eng. rivs.: 1. The boundary between Suffolk and Essex. It flows into the estuary of the Orwell at Harwich, and is navigable to Sudbury. Length 47 m. 2. The Great Stour, rises near Lenham, Kent, and flowing past Ashford, Canterbury, and Sandwich, enters Pegwell Bay. Length 40 m. It has two tribs., East S. and Little S. 3. A trib. of the Hampshire Avon, rises in Wiltshire, and flowing through Dorsetshire and Hampshire, joins the Avon at Christchurch. Length 55 m. 4. A trib. of the Severn, which it joins at Stourport (q.v.). Length 20 m.

**Stourbridge**, municipal bor. and mkrt. tn. of Worcestershire, England, 12 m. W. of Birmingham, on the R. Stour. It includes the former townships of S. Wollaston, and Swinford. It has a tn. hall (1887), an Edward VI. grammar school (1552), which Dr. Johnson attended (1726-1727), a blue-coat school (1667). The tn. has glass manufs., estab. by Hungarian immigrants about 1556, brickworks manufs. of leather and hardware, and coal mines near by. Pop. 34,000.

**Stourbridge Fair**, see FAIR.

**Stourport**, urb. dist. and mkrt. tn. of Worcestershire, England, at the junction of the Severn and Stour, the former being crossed here by a handsome bridge. The town of the Staffordshire and Worcestershire Canal, it is a centre of inland navigation. Carpets, iron and porcelain goods, and wire products are made, and there are petrol storage depots. Pop. 10,000.

**Stout**, alcoholic beverage, popular in England, concocted from a brew of ordinary and burnt malt, with caramel and malt substitutes added. Alcohol, carbohydrates, organic acids, and water are the prin. constituents of the finished product. There are varieties of S., such as oatmeal, invalid, etc. In neuralgia troubles the drinking of S. is often beneficial, especially when mixed with milk. See also under BREWING, Varieties of Beer.

**Stovaine**, see ANÆSTHESIA.

**Stove, see HEATING.**

**Stove Houses, see HOTHOUSE.**

**Stow, John** (1525–1605), Eng. antiquary and chronicler, b. in London. He was a tailor by trade, but had a lifelong passion for antiquarian research, and the writing of hist. Though honoured for his work, he remained poor, and received patents to take gifts from James I. S. is best remembered by his *Surrey of London* (1598). His statue is in the city church of St. Andrew Undershaft, and is still honoured by the custom of placing a new quill pen in his hand each year. He ed. Chaucer's *Works* (1561), and pub. *A Summarie of Englyshe Chronicles* (1565) and *The Chronicles of England* (1580, republished as *The Annales of England*, 1592). The *Surrey* was later issued in sev. revised eds. See ed. by C. L. Kingsford, 1908–27 (from the text of 1603), and ed. in Everyman's Library, 1912.

**Stowe, Harriet Elizabeth Beecher** (1812–1896), Amer. novelist and philanthropist, b. at Litchfield, Connecticut, U.S.A. In 1836 she married Calvin Ellis S. Her first pub. was *The Mayflower* (1843). *Uncle Tom's Cabin* appeared in *The National Era*, in serial form, in 1850, and on its pub. as a book two years later attained an almost unexampled popularity. Half a million copies were sold in the U.S.A., and it was trans. into twenty-two foreign languages. It had a great influence in stirring up public opinion in the N. of the U.S.A. against slavery. In 1853 S. visited England to lecture on the slavery question. Among her succeeding novels were *Dred, a Tale of the Great Dismal Swamp* (1856); *The Minister's Wooing* (1859); and *Old Town Folks* (1869). See lives by C. E. and L. B. Stowe, 1889; C. Gilbertson, 1937; and F. Wilson, 1942.

**Stowell, Lord, see SCOTT, WILLIAM.**

**Stowe School**, Eng. public school at Buckingham, founded in 1923. The central building was erected in the eighteenth century and was the seat of the dukes of Buckingham and Chandos. The first headmaster (1923–49) was J. F. Roxburgh. The school accommodates some 550 boys.

**Stowmarket**, mrkt. tn. and urb. dist. of Suffolk, England, on the Gipping, 12 m. N.W. of Ipswich. Its manufs. include paints and agric. implements. Pop. 7400.

**Stow-on-the-Wold**, mrkt. tn. and urb. dist. of Gloucestershire, England, on the Fosse Way, 20 m. N.E. of Cheltenham. It is a place of recognised charm, with an old church and a fourteenth-century market cross. Pop. 1500.

**Strabane**, mrkt. tn. in co. Tyrone, N. Ireland, on the R. Mourne. Shirts and underclothing are made. Pop. 6000.

**Strabismus, see SQUINTING.**

**Strabo** (c. 63 B.C.–A.D. 25), Gk. geographer and historian, b. at Amasia in Pontus. He travelled extensively in Greece, Italy, Egypt, Sardinia, and Ethiopia. His historical memoirs remain only in fragments, but his *Geographica*, the most important work of antiquity on that science, is extant, almost complete, in seventeen books. There is an ed., with trans. of *On the Troad*, by W. Leaf (1923),

and a complete ed. in the Loeb series, with trans. by H. L. Jones (5 vols., 1922–28).

**Strabolgi, Joseph Montague Kenworthy**, tenth Baron (b. 1886), Brit. sailor, politician, and author, entered the R.N. in 1902, and served in the First World War. He was a Liberal M.P. from 1919 to 1926, and a Labour member until 1931. He succeeded to the peerage in 1934, and became chief Labour whip in the House of Lords. His pubs. include the autobiographical *Statesmen and Others* (1933); *The Battle of the River Plate* (1940); *Singapore and After* (1942); *Sea Power in the Second Great War* (1943); and *Conquest of Italy* (1944).

**Strachey, Giles Lytton** (1880–1932), Eng. author, b. in London, studied at Trinity College, Cambridge. He contributed to reviews, and attained prominence with *Landmarks of French Literature* (1912). S. became famous in 1918 with *Eminent Victorians* (lives of Cardinal Manning, Florence Nightingale, Arnold of Rugby, and Gen. Gordon). In 1921 his life of *Queen Victoria* appeared, arousing wide interest and much controversy. His next large biography was *Elizabeth and Essex* (1928). S. was a critic of literature as well as of hist., his rational insight being proved by *Books and Characters* (1922), studies of Racine, Voltaire, the later Shakespeare, etc., and by his Leslie Stephen lecture on Pope (1925). He also contributed some ninety full-length reviews to the *Spectator* (1904–14), then under the editorship of John St. Loe S. (q.v.) who was his cousin. S. estab. a fashion for a new type of biography, in which, however, his imitators too often repeated his faults without his virtues, after the immense and usually tedious works of his predecessors. His point of view, which gave his work its tremendous readability, ultimately mars his standing as an historian. He was primarily a humanist, and historical problems he saw as problems of individual behaviour and eccentricity. Thus he missed the real political significance of such men as Prince Albert and Disraeli. Even within his limits he showed some serious defects; he could not bear to be dull, and therefore strained his material for the sake of humour and interest. His *Elizabeth and Essex* shows these faults most clearly; he was basically out of sympathy with the Elizabethan Age. His best, if least popular works, are his first and *Books and Character*. Always an exquisite stylist, S. was at his best a fine scholar also. His collected works were pub. in 1919. See studies by G. Bous, 1935; C. Clemens, 1942; and Sir Max Beerbohm, 1943.

**Strachey, John St. Loe** (1860–1927), Eng. author and newspaper proprietor, b. at Sutton Court, Somerset, educated privately and at Balliol College, Oxford. From 1896 to 1897 he ed. the *Cornhill*, and in 1897 became editor and proprietor of the *Spectator*, which was maintained in a most influential position under his guidance. In 1925 he retired from the management of the *Spectator*, although he continued contributing. The last years of his life were devoted to writing books,

including two vols. of autobiography (*The Adventure of Living*, 1922, and *The River of Life*, 1924) and one novel (*The Madonna of the Barricades*, 1925). Other books include *From Grave to Gay* (1897); *The Problems and Perils of Socialism* (1908); *Economics of the Hour* (1923); *The Itinerary* (1924); and *American Soundings* (1926). See life by Amy Strachey, 1930.

**Stradella, Alessandro** (c. 1645-c. 1681). It. composer, *b.* at Naples. He taught singing in Venice, and went later to Turin and Rome, but little is known of him except that he was murdered at Genoa. His vocal work is notable for energy of expression, and the broader form of aria with richer instrumental accompaniment. He is credited with five operas, six oratorios, including *S. Giovanni Battista* (pub. 1676), and sev. cantatas.

**Stradivari, Antonio** (? 1644-1737), one of the greatest makers of the violin, associated with Cremona. He was an apprentice under Nicolo Amati, and until 1684 devoted himself chiefly to small models in the Amati style. In 1690 he began making 'long Strads,' and finally, after 1700, he discarded the Amati style and pursued original lines. Two famous 'Strads' are the Boissier (formerly owned by Sarasate) and the 'Alard,' considered his masterpiece. He is famous also as a maker of violas and violoncellos. See life by Hill (new ed., 1909).

**Strafford, Sir Thomas Wentworth**, first Earl of (1593-1641), Eng. statesman, *b.* in London of an estab. Yorkshire co. family. He studied at St. John's College, Cambridge. He entered Parliament, and soon became prominent in the parl. opposition, strongly criticising the actions of Charles's ministers. He supported Eliot against Buckingham and was imprisoned for refusing to pay the forced loan. Wentworth was one of the instigators of the movement which resulted in the Petition of Right, though his views fell short of those expressed in the final draft, and in 1629 he went over to the king's party. He was concerned, not with the principles of government, but with its efficacy and efficiency, believing that Parliament should be essentially advisory, the king and his ministers being the effective executive. Therefore he considered that the prime need was for able royal ministers, and eagerly accepted the king's offer to make him one. He became president of the Council of the N., where he vigorously upheld the rights of the Crown. Charles, however, did not give him real support, and when Wentworth was made Lord Deputy of Ireland in 1633 the appointment was not so much a mark of favour as a royal way of removing an embarrassing enthusiast. By his policy of 'Thorough' Wentworth had in six years estab. the most efficient gov. Ireland had ever known.

Charles gave him his confidence only when it was too late. In 1639, after the first Bishops' war, he summoned Wentworth to him and created him Earl S. S. urged the king to summon Parliament, apparently hoping that national hatred of the Scots would persuade the opposition

to vote supplies. Perhaps his successful handling, cajolery, and bullying of the Irish Parliament, still in fact as well as in theory an advisory body, made him forget the real progress towards parl. sovereignty that had been made in England; nor did he realise the extent of Pym's hatred towards his former friend. In 1640 Pym moved S.'s impeachment, but it soon became clear that the impeachment could not succeed. He was then proceeded against by attainder. Charles was persuaded to sign the death warrant and S. was executed.

His character remains to some extent enigmatic, though, if his belief in good government is accepted, his actions can be proved throughout consistent. His contemporaries accused him of overwhelming ambition, yet this seems false, for had this been his prime motive he could have remained with Parliament and come to power as one of its leaders. He chose to be the servant of a king who consistently undermined his actions, who never liked him, and who only turned to him when he was in desperate straits. See lives by C. V. Wedgwood, 1935, and Lord Birkenhead, 1938. See also C. H. Firth, ed., *Papers Relating to Thomas Wentworth, first Earl of Strafford* (Camden Miscellany, vol. ix), 1890, and Gervase Holles (A. C. Wood, ed.), *Memoirs of the Holles Family, 1493-1656*, 1937.

**Strahan**, seaport of Montague co., Tasmania, on Macquarie harbour, the outlet for the copper mine at Mt. Lyell. There is railway communication with Burnie, on the N. coast. Pop. 8500.

**Strain and Stress.** Strain is the change in size or shape or both of a body under the action of stress; stress is a set of forces in equilibrium maintaining a strain. Within certain limits the ratio stress to strain is a constant, called the modulus of elasticity. Stress is measured in force per unit area, strain has no dimensions. Stresses though composite in practice may be divided for theoretical purposes into two classes: normal stresses which tend to increase or decrease size without altering shape (as when a motor-tyre is inflated); tangential or shearing stresses, a 'couple,' which tends to change shape without changing size (as when a book is distorted by forcing the covers in opposite directions). Solids resist both these stresses, *i.e.* have high elasticity and rigidity; liquids offer great resistance to compression, but practically none to change of shape, *i.e.* have very low rigidity; gases have low elasticity and rigidity. In the case of a wire stretched under the action of a longitudinal stress the strain is compound, as the wire alters simultaneously in size and shape. In the equation

$p = q \frac{dl}{l}$ ,  $q$  is called Young's modulus, and has important practical applications; this constant depends on both the elasticity and rigidity of the given material. See also ELASTICITY; METALLURGY; SHEAR; STRENGTH OF MATERIALS.

**Strait**, narrow connecting passage, usually formed by land subsidence, between two seas or oceans.



**Straits Settlements**, general name before 1946 for the Brit. Crown Colony, which comprised Singapore, Penang, and Malacca in Malaya; Labuan, off the N. coast of Borneo; and Christmas Is. and the Cocos-Keeling Is. to the S. of Sumatra. All these ters. are situated in the E. Indies, on and off the Malay Peninsula. Far-reaching post-war political changes, announced in 1946, had for their purpose the simplification and reform of the system of gov. throughout Brit. Malaya (*q.v.*). Under these changes, which introduced a Malayan Union to embrace all Brit. Malaya (excepting Singapore for the time being), the pre-existing combination of the S. S. of Penang, Malacca, and Singapore in one political unit was readjusted so that the settlement of Singapore should be a separate colony under a separate governor, while the settlements of Penang and Malacca should be administered with the Malay States, also under a separate governor, in the new federation of Malayan Union. This change, as regards the S. S., was effected under the Straits Settlements (Repeal) Act, 1946.

**Stralsund**, seaport of Mecklenburg (Prussian prov. of Pomerania), Germany, on the Strela Sound, connected with the mainland, residential and industrial suburbs by bridges. The old tn. still preserves a medieval appearance, with narrow streets and gabled houses, fourteenth-century churches, and a tn. hall of the thirteenth to fifteenth centuries. The tn. was founded by Prince Jaromar I. of Rugen about 1209, and became an important member of the Hanseatic League. It withstood a siege by Wallenstein (1628) during the Thirty Years war. It was ceded to Sweden in 1648 and restored to Prussia in 1815. The tn. is an important trading centre. There are manufs. of chemicals and sugar, and engineering and shipbuilding. Pop. 43,600.

**Stramonium**, in pharmacology a drug obtained from the leaves and seeds of *Datura stramonium*, or jimson weed. It contains the alkaloids daturine and hyoscyamine. It is used as a substitute for belladonna in asthma, neuralgia, rheumatism, etc. The leaves are smoked in a pipe or in the form of cigarettes for asthma.

**Strand**, London thoroughfare running N.E. from Trafalgar Square to Fleet Street. It is first mentioned in the *Anglo-Saxon Chronicle* for 1052, and its name probably applied also to the present Fleet Street, forming a continuous thoroughfare parallel to the Thames.

'**Strand Magazine**,' pioneer Eng. monthly magazine of light popular literature, with copious illustrations, founded in Jan. 1891 by George (afterwards Sir George) Newnes, who from the start was the editor-in-chief. Later H. Greenhough Smith, who was acting editor until the death of Newnes, became sole editor, and remained for more than forty years. Early success was achieved by the *Adventures of Sherlock Holmes*, illustrated by Sidney Paget's imaginative likenesses of Holmes and Watson; while later numbers contained the humorous tales of W. W.

Jacobs, with their realistic studies of Thames river-side low life, the effectiveness of which was enhanced by the illustrations of Will Owen. It was to the S. M. that Kipling contributed *Puck of Pook's Hill* and H. G. Wells *The First Men in the Moon*, both works of higher literary craftsmanship than the usual run of popular magazine stories. Later interest was sustained by P. G. Wodehouse's inimitable 'Jeeves' and the pleasant trifles of Denis Mackail. With the March 1950 issue the S. M. ceased pub. owing to the economic difficulties of the time. Its circulation at that time was 100,000.

**Strand Theatre**, in Aldwych, London, opened in 1905 as the Waldorf, Duse playing the lead in the first production, *The Second Mrs. Tanqueray*, by Sir Arthur Pinero. Its name was changed to Strand in 1909. Successful plays include *Anna Christie* (1923); *1066 and All That* (1935); and *Arsenic and Old Lace* (1942). There was an earlier theatre of the same name in the Strand from 1836 to 1905.

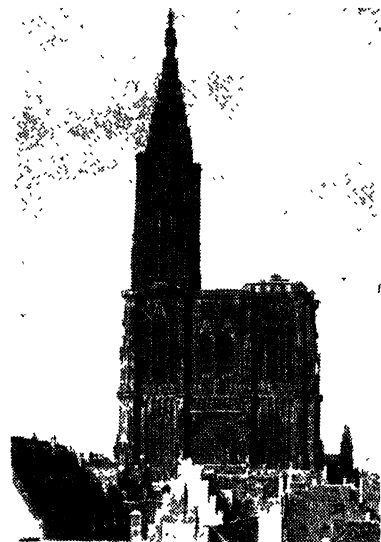
**Strangles**, see under HORSE (DISEASES).

**Strangulation**, constriction of a part so as to arrest circulation of the blood. The commonest form is suffocation by constriction of the windpipe. In a case of death by S., all the evidences of asphyxia are present, and the marks of the strangulating agent are seen on the neck. *Strangulated hernia* is one in which the blood is prevented from circulating by the constriction of the neck of the sac. If not relieved by surgical interference the tumour swells and the bowel ultimately mortifies at the neck of the sac, with the result that the contents of the tumour are discharged into the abdominal cavity.

**Stranraer**, seaport and royal burgh of Wigtownshire, Scotland, on Loch Ryan, 8 m. N.E. of Port Patrick. Its chief building of interest is the old castle. Its large tidal harbour is used as the terminus of a cross-channel service with Ireland. It trades in dairy produce, and has oatmeal mills and nurseries. Pop. 8300.

**Strasbourg**, or **Strassburg** (Fr. *Strasbourg*), cap. of the dept. of Bas-Rhin, France, in Alsace-Lorraine, at the junction of the Ill and the Bruch, 2 m. W. of the Rhine, near its junction with the Rhine-Rhone and Rhine-Marne canals. It is a fortress of the first class, and is the seat of a Rom. Catholic bishop. The univ., founded in 1567, and suppressed from 1790 to 1872, has about 2700 students. Much of medieval S., which stood on an is. in the R. Ill, flowing northwards through the plain of Alsace to join the Rhine a little below the city, is still preserved. Angled with the medieval core are gracefully symmetrical buildings of the eighteenth century. The most interesting buildings are the cathedral (eleventh to fifteenth centuries), the church of St. Peter (twelfth to thirteenth century with an eleventh-century transept), the church of St. Thomas (thirteenth to fourteenth century), and the Gr. Renaissance Rathaus (1582-85). S. (Rom. *Argentoratum*) was the scene of a victory of Julian over the Alamanni (357). It became a flourishing

imperial tn., and numbered among its famous citizens Eckhart, Tauler, Gottfried von Strassburg, Sebastian Brant, and Thomas Murner. It was seized by France under Louis XIV. in 1681, but surrendered after siege to the Gers. in 1870. After the First World War it passed, with Alsace-Lorraine, to France, but was lost again to the Gers. on the Fr. collapse in 1940. In Nov. 1944 the Amer. Seventh Army crossed the N. Vosges to reach the Rhine at S., and on Nov. 24 advanced elements of the Fr. Armoured Div. were fighting in the streets of S. (see further under WESTERN FRONT IN SECOND WORLD WAR). There-



—Lrussel

STRASSBURG, CATHEDRAL FROM THE WEST

was severe structural damage both to the cathedral and to the eighteenth-century bishop's palace, but, generally speaking, the damage was of a repairable character. S. was selected as the headquarters for the Council of Europe in 1949. S. was important from ant. times as a communication centre. Once freed from the restricting circle of its fortifications, many industries were estab., including metals, machinery, motor vehicles, glass, paper, and tobacco. It is famed for its preserved foods, especially *pâté de fow gras*. Pop. 175,500. See B. Newman, *The Sisters. Alsace-Lorraine*, 1950.

**Strassburg, Gottfried von**, see GOTTFRIED. **Strasser, Gregor** (1892-1934), Ger. politician, b. at Geisenfeld in Upper Bavaria. He took part in Hitler's *putsch* of 1923. Later he organised the National Socialist party in the Reichstag. Until 1932 he was an important figure, but after that date, opposing, for example, Streicher's

anti-Semitism, he lost favour. S. was murdered in the 1934 purge.

**Strasser, Otto** (b. 1897), Ger. politician, b. at Windsheim. He joined his brother Gregor (see above) in the Nazi party and directed its Berlin publishing house from 1926 to 1930. He then founded the Black Front, suppressed when Hitler came to power in 1933. S. fled abroad, finally to America.

**Strata Florida** (*Istradflur*), par. and vil. of Cardiganshire, Wales, N.E. of Tregaron. (The modern Welsh name is **Caron Uwch Clawdd**.) Near by are the ruins of a Cistercian abbey, one of the largest in Wales, near the source of the Teifi. It was founded in 1164, and suffered during the wars of Edward I. (1294). A W. portal in the transitional Norman-Eng. style (twelfth century) remains, and the foundations and some interesting tiles have been excavated.

**Strategy and Tactics.** **MILITARY:** By strategy is understood the art of planning a campaign in war; the attempt to gain advantage over an enemy before any actual conflict takes place. Success depends on correctly foreseeing the enemy's scheme, while arranging one's own plans in such a manner as may be unexpected by him. For such a purpose a thorough knowledge of the topography of the scene of war is of first importance. Climate and season are additionally factors of early importance. Beyond this, again, come all plans which aim at crippling the enemy resources, particularly in trade and commerce. Strategy, however, cannot be relied on to outweigh deficiency in numbers, or want of training, organisation, and equipment; it rather consists in the scientific use of these, and in our co-ordination of effort by land, sea, and air.

**Tactics**, while consisting often of strategy in miniature or well-defined conditions, is the term applied to the execution of plans, with variations as found immediately necessary, when actually in contact with the enemy. The lines of battle being drawn out, the operations until victory is won or defeat sustained are tactical, then again merge into strategy until actual conflict once more ensues. It is obvious that tactics are mainly a matter of the study of contact in its fullest sense. Whereas strategy has in many ways remained the same throughout hist., tactics have been modified by the introduction of every new tool, arm, method of fortification, etc. Under the head of tactics must also be considered the arrangement of the attacking army in marching before contact with the enemy, the disposition of forces in the field, the securing of controlling positions, entrenching, taking cover, the keeping of reserves, the order in which detachments enter into conflict, the setting in motion of large or small flanking movements.

An important tactical innovation was the successful opposition to the charge of the armoured and mounted knights by the Flemings in the Middle Ages. Archers and pikemen were so employed against the Eng. cavalry by the Scottish at the battle of Bannockburn, with disastrous results

to the cavalry, who, however, having learnt the lesson, employed it against the Fr. in the Hundred Years war with equal success. The use of gunpowder produced a much slower change in tactics, but of like nature. The introduction of the rifle and its perfected bullet made precision in aim surer and range greater; artillery has served the same end, and machine guns have further made a more open formation necessary. The rapid and sure means of communication and means of transport have kept pace with these changes, so that a battle front may now extend over many miles.

Warfare has grown so complex that in the Brit. Field Service Regulations issued since the First World War a set of general principles has been laid down for the guidance of officers; they are: (i.) *Maintenance of the objective*, the destruction of the enemy's main forces on the battlefield, is the governing consideration which must always be kept in view. (ii.) *Offensive action* alone can bring victory. (iii.) *Surprise*, strategical, tactical, or in the employment of material, is the most effective and powerful weapon in war; whether in attack or defence, the first thought of a commander must be to outwit his adversary. (iv.) *Concentration* of superior force, moral and material, at the decisive time and place, and its resolute employment in the battle are essential for the achievement of success. (v.) *Economy of force*: to economise strength while compelling a dissipation of that of the enemy must be the constant aim of every commander. (vi.) *Security*: the security of a force and of its communications is the first responsibility of a commander. To guard against surprise; to prevent the enemy from obtaining information; to dispose his covering troops so as to allow his main forces to move and rest undisturbed—these are the considerations which must govern his actions in attack and defence. (vii.) *Mobility* implies the power to manoeuvre and act with rapidity, and is the chief means of effecting surprise. (viii.) *Co-operation*: only by effective co-operation can the component parts of any force develop fully their inherent power. All leaders down to those of the smallest units must endeavour to apply, at all stages of a fight, this principle of mutual support. These principles are for guidance only and must be modified as circumstances dictate. Very few tacticians concur on the application of principles to particular campaigns or operations, but those given above have been formulated after careful study, and may be accepted without much qualification.

#### *Some Second World War Developments.*

—The conception formed in the First World War that artillery barrage fire is essential to prepare the way for advancing assault troops still holds good, but its function is more usually to smother the enemy forward infantry while the attacking sappers clear a gap for the armour through the minefields. The tank attack which drives on through one or more such gaps followed by motorised infantry must proceed on the assumption that there is no additional

artillery fire-screen far in the rear; all available field artillery will be needed to keep open, and if possible widen the shoulders of the original breach.

The Second World War showed, especially on the E. front, a considerable development of 'pincer' attacks, designed to envelop the objective from both flanks simultaneously, in complete contrast to the frontal offensive. The form of double envelopment usually employed was one which provided for a special disposition of formations for assault within and behind its own wings, which by supposition have already engaged the enemy. The forces detailed to carry out the pincer attack move behind their own wings and, at the opportune moment, move in an oblique direction, thereby possibly securing more protection against air detection. Resistance is necessarily strongest at the moment when the deeply echeloned pincers have half encircled their victim and are closing in. Co-operation between all divs. along the attacking front is essential, for in no circumstances may the divs. facing the enemy front stand by inactive while their own outflanking pincers are pressing on, and, although their movements are of secondary importance, the frontal attack, or at least its simulation, obviously becomes of the greatest importance in the final stage of the operation when the encircled enemy is unable to extricate his divs. from the claws of the pincers. This was illustrated at the battle of Stalingrad when von Paulus's Sixth Ger. Army was eliminated, and by many other, if less spectacular, enveloping operations for by-passing 'hedgehogs' on the Russian front.

The failure of the Ger. Army before the defences of Moscow in Nov.-Dec. 1941 demonstrates the flaws in the Ger. strategy so successfully exploited in the previous months in White Russia. When the break-in N. and S. came short of their objectives the Ger. high command hoped that by shortening the front of attack they would make up for their lack of forces in depth. The modern conditions of increased mechanisation and fire-power require that the attacking force should be echeloned in much greater depth before the attack is opened, and not only must the attacking commander have ample formations at his disposal, but they must pierce to the rear of the defensive lines in the quickest possible time. It will not suffice merely to pierce the defensive zone by an attack of attrition, the attack must be launched regardless of loss, and carried through at top speed. Even if the attacking commander does reach the rear of the adversary's zone after a struggle of tanks and anti-tank guns, his armour will not necessarily be able to exploit the 'break-through' by the method of 'fanning out'; for exhaustion may compel them to halt just when dynamic exploitation may be vital to future operations. These considerations emphasise, too, the fact that reconnaissance, before and during an offensive, is still as important as ever in strategy.

Critics of post-war Amer. strategy

doubt whether the policy of bases stretched out to vast distances was in fact the wisest from the Amer. point of view, because communications, whether by air, sea, rail, or road, consume manpower and resources of all kinds. They are especially critical of distant bases in the Pacific; for bases in the W. Pacific, without large garrisons and large mobile forces, will be a source of strategic weakness rather than of strength.

Strategic bombing also has its critics. Some argue that bombardment not followed by assault must involve a great waste of energy and resources. Heavy damage may be done to production, but owing to the inaccuracy of strategic bombing, it is considered by some to be the most wasteful of all forms of attack. Finally, these critics contend that of all methods of waging war this is the one least well adapted to achieve the object of war, which is peace (see further under AERIAL WARFARE).

**NAVAL:** Naval strategy is governed by the same principles of war as those described in the preceding section. Its aim is the manipulation of naval forces for the control of sea lanes and the denial of those lanes to the enemy. Tactics, on the other hand, is the art of disposing and handling forces in contact with the enemy, but in these days of long-range missiles and aircraft, the border line between the two is often imperceptible. This fundamental aim of maritime warfare, the protection of sea communications, may appear essentially defensive, but its implementation requires an offensive strategy, because the surest way of affording protection is by the destruction of the menace that threatens, for example, the enemy fleet and its auxiliaries. So Brit. naval strategy has always aimed at bringing enemy ships to action at every opportunity. One way of achieving this was by the imposition of blockade which might force an enemy fleet to give battle so as to free the restrictions imposed. In the old days it was possible to establish a close blockade off enemy coasts, but in view of the air and submarine menace that is no longer possible. So close blockade was first abandoned for open blockade by the Brit. Navy during the First World War, and Brit. indignation over the fact that, in consequence, the enemy did not sully forth to enable the R.N. to fight a fleet action was only equalled by the fury that Brit. ships were not placed off their coasts where they could be attacked by superior forces. But, though blockade failed to bring the enemy fleet to action, it was an important feature of naval strategy in the economic war.

Convoy is another form of naval strategy. Not only does it enable the maximum protection to be afforded to merchant shipping, but it also provides the best opportunities for offensive action against enemy submarines. More U-boats in both world wars were destroyed by ships escorting or operating with convoys than under any other circumstances. It also offers a bait to other enemy naval forces (though this is not always desired), and might well result in a decisive fleet action.

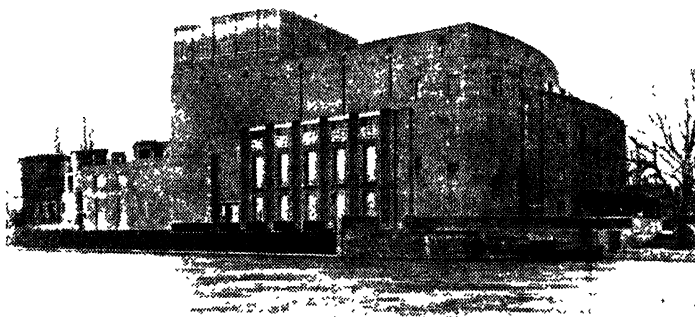
Attack at source by means of aircraft or long-range missiles is now a surer and more feasible operation than it used to be, and one of the most outstanding examples of this in the Second World War was the fleet air arm attack on the It. fleet at Taranto on Nov. 11, 1940.

Without adequate and well-positioned bases, however, no naval strategy is possible. They are essential for the exercise of sea and air power. With the development of air power absolute command of the seas is no longer possible, so naval strategy to-day aims at gaining zones of maritime supremacy. As already pointed out, a tactical situation may now develop long before surface forces are in sight of one another; but the aim of a commander seeking battle is, whenever possible, to interpose his force between the enemy and his base, take advantage of the light and the wind, and bring maximum fire-power to bear from more than one direction, while being in a position easily to manoeuvre his ships to comb enemy torpedo tracks. Before the advent of the aeroplane in naval warfare, ships would aim to deploy in a long column at right angles to the bearing of the enemy when sighted, but to-day consideration in the formation and disposition of ships must be given to repelling air attack while possibly engaging a surface enemy force. Ships, too, may be further apart than formerly, thus making it uneconomical for an enemy to use atom bombs and more difficult for other aircraft to attack with success. But a balance has to be drawn, for the further ships are apart, the less the effectiveness of any anti-submarine screen they may have.

See H. Jomini, *Précis de l'art de guerre*, 1831; C. von Clausewitz, *Vom Kriege*, 1832; C. von der Goltz, *Krieg und Heerführung*, 1901; H. von Schlieffen, *Gesammelte Schriften* (4th ed.), 1913; J. F. Fuller, *The Reformation of War*, 1923, *Armoured Warfare*, 1943, and *The Second World War*, 1948; F. Foch, *De la conduite de la guerre*, 1927; H. Newbolt, *Official History of the War: Naval Operations* (vol. iv.), 1928; H. W. Richmond, *Naval Warfare*, 1930; C. de Gaulle, *Vers l'armée de métier*, 1934; E. Rommel, *Infanterie Greift An*, 1937; T. Winteringham, *New Ways of War*, 1940; B. Brodie, *A Layman's Guide to Naval Strategy*, 1943; L. Hart, *Thoughts on War*, 1943, *The Strategy of Indirect Approach*, 1944, and *Revolution in Warfare*, 1946; T. R. Phillips, *Roots of Strategy*, 1943; A. H. Burn, *The Art of War on Land*, 1944, and *Strategy as Exemplified in the Second World War*, 1946; D. Eisenhower, *Report by the Supreme Commander to the Combined Chiefs of Staff on the Operation in Europe of the Allied Expeditionary Force*, June 6, 1944, to May 8, 1945, 1946; Sir W. M. James, *The British Navies in the Second World War*, 1946; Viscount Montgomery, *El Alamein to the Sangro*, 1946, and *Normandy to the Baltic*, 1946; G. C. Marshall, H. H. Arnold, and E. J. King, *The War Reports*, 1947, S. E. Morison, *History of the U.S. Naval Operations in World War II*, 1947; and P. M. S. Blackett, *Military and Political Consequences of Atomic Energy*, 1948.

**Stratford:** 1. Suburb of London in the co. bor. of W. Ham, Essex, England, 4 m. E.N.E. of St. Paul's. It has light and heavy industries, particularly chemical works, manufs. of soap, printing inks, varnish and paint, and railway machine shops and depot. 2. Cap. and port of entry of Perth co., Ontario, Canada, on six lines of the Canadian National Railway, which has repair shops here. Furniture is made in large quantities. Other products are electrical appliances, machinery, knitted goods, and felt boots. 3. Tn. of Taranaki prov., N. Is., New Zealand, 25 m. S.E. of New Plymouth, on the main railway line to Wellington, and the junction for Auckland. Pop. 4100. 4. Tn. of Fairfield co., Connecticut, U.S.A., 5 m. N.E. of Bridgeport. Pop. 22,600.

1490 by Sir Hugh Clopton, lord mayor of London. The tn. is famous as the bp. of Shakespeare, and is visited every year by travellers from all parts of the world. Here may be seen the reputed bp. of the poet in Henley Street, purchased for the nation in 1847 for £3000. Anne Hathaway's cottage, 1 m. from the centre of the tn.; the graves of the poet and his wife in the chancel of Holy Trinity; 'The Cage,' which was for thirty-six years the home of Judith, Shakespeare's younger daughter wife of Thomas Quiney, vintner; Hall's Croft, old-timbered residence of Susanna, the poet's elder daughter, who married Dr. John Hall, his executor, Wilmore, the house of Shakespeare's mother, Mary Arden, a fine timbered manor house of the Tudor period; and



Ernest Daniels

THE SHAKESPEARE MEMORIAL THEATRE, STRATFORD-ON-AVON

**Stratford de Redcliffe, Stratford Canning,** first Viscount (1786-1880), Eng. diplomat, b. in London, educated at Eton and King's College, Cambridge. Through the good offices of his cousin, George Canning, he became secretary of the embassy at Constantinople in 1808, and minister plenipotentiary in 1810. He exercised great skill in negotiating the treaty of Bucharest between Russia and Turkey in 1812. After service in Switzerland (1814-20), where he settled the problems of federal gov., he became minister to the U.S.A. (1820-24). He was envoy to St. Petersburg (1824), and to Constantinople (1825), and later entered Parliament. He was at Constantinople again in 1842 as ambas., and remained there throughout the Crimean war, largely influencing the political reforms and foreign relations of Turkey and earning for himself the title of 'The Great Elchi' (great ambas.). His papers, etc., were pub. with preface by A. P. Stanley, under the title of *The Eastern Question* (1881).

**Stratford-on-Avon,** municipal bor. and mkt. tn. of Warwickshire, England, 22 m. S.S.E. of Birmingham, pleasantly situated in the wooded valley of the Avon. The riv. is crossed by a fine bridge, erected in

King Edward VI. grammar school, founded c. 1429 by Rev. Thomas Jolyffe M.A., of Stratford, and re-endowed by Edward VI. The Shakespeare Memorial, mainly due to the munificence of C. E. Flower (1830-92) and his wife, comprises a library with 10,000 vols. of Shakespeare ed., and dramatic literature, and a gallery of pictures, including the 'Droeshout' portrait. The Memorial Library and Reading Room are available for use by accredited students. The red-brick Shakespeare Memorial Theatre (1877-79), where performances of his plays were given annually, was destroyed by fire in 1926; the festival plays were performed in a temporary theatre until the completion in 1932 of the new memorial theatre, the architect of which was Elizabeth Scott. The art gallery and museum, containing pictures and exhibits illustrative of the hist. of the theatre and of Shakespeare's production, adjoins the memorial theatre building in Waterside. S. is a place of great antiquity. The chapel of the guild of the Holy Cross dates from the thirteenth century. Holy Trinity church occupies the site of a Saxon monastery, and dates from the thirteenth century. The tn. hall, first erected 1633, was

rebuilt in 1768. Here are complete records of the sequence of bailiffs, mayors, and tn. clerks from 1553 (including the poet's father, John Shakespeare), and of high stewards from 1610. Alveston was, in 1924, incorporated in the bor. The tn. trades in cattle and agric. produce; 4 m. E. of the tn. Charlecote Park and its sixteenth-century house were acquired by the National Trust in 1945. *See* W. S. Brassington, *Shakespeare's Homeland*, 1913; J. H. Bloom, *Medieval Stratford*, 1915; H. E. Forest, *The Old Houses of Stratford*, 1925; E. I. Fripps, *Shakespeare's Stratford*, 1928; M. C. Day and J. C. Trewin, *The Shakespeare Memorial Theatre*, 1932; J. C. Trewin, *The Story of Stratford-upon-Avon*, 1950; and A. Burgess, *Warwickshire*, 1950.

**Strathalbyn**, tn. of Hindmarsh co., S. Australia, 35 m. S.E. of Adelaide, on the R. Angas, and the railway to Port Elliot, in the S. Mt. Lofty Ranges. It is one of the beauty spots of the state, and is the centre of a rich dairying dist. Pop. 1200.

**Strathaven (Strathavon)**, mrkt. tn. and holiday resort of S. Lanarkshire, Scotland, on Avon Water, 14 m. S.E. of Glasgow. It has a ruined fifteenth-century castle. Manufs. include silk: this industry has revived in recent years. In the Middle Ages S.'s silk was very famous, and the tn. had considerable importance. Grain and cheese are also produced. Pop. 5900.

**Strathelyde**, kingdom formed by Brit. folk fleeing from the Angles, c. 560, and covering the W. part of the lowlands of Scotland, Westmorland, and the greater part of Cumberland. Its cap. was Alclyde, the rock fortress at Dumbarton. It came from time to time under Northumbrian influence, but preserved its Brit. outlook until in 924 it submitted to Edward the Elder.

**Strathcona and Mount Royal, Donald Alexander Smith, first Baron** (1820-1914), Canadian politician, b. at Archibaldtown, Morayshire, Scotland, emigrated to Canada, and entered the Hudson's Bay Company's service in 1838. He introduced potato-growing into Labrador, where he was stationed. In 1869 he was governor of the company's terr., and in 1871 became chief commissioner of the N.W. S. was special commissioner during the Kiel rebellion in the Red River Settlements. He was a member of the first Executive Council of the N.W. Terr., represented Winnipeg and St. John's in Manitoba legislature (1871-84), was M.P. for Selkirk in the Dominion House of Commons (1871-72, 1874, and 1878), and for Montreal W. (1877-96). He was largely instrumental in forming the Canadian Pacific. S. was made K.C.M.G. (1886); G.C.M.G. (1896); and was ennobled in 1897. From 1896 until his death he was high commissioner for Canada in Britain. At his own expense he raised a troop of 600 men (Strathcona's Horse) who served gallantly in the S. African war.

**Strathmore and Kinghorne, Earl of**, Scottish title held by the Lyon family, the Strathmore barony since 1445, and the earldom of Kinghorne since 1606. John, the ninth earl (1737-76), took the addi-

tional name of Bowes. Lady Elizabeth (Angela Marguerite), daughter of Claude George (1855-1944), the fourteenth earl, married Prince Albert, duke of York, in 1923, and in 1936 became queen consort when he succeeded to the throne as George VI. on Dec. 11. The family seat is Glamis Castle, Angus.

**Strathmore**, wide valley of Scotland, bounded on the N. by the Grampians, and on the S. by the Lennox, Ochil, and Sidlaw Hills.

**Strathpeffer**, vil. and spa of Ross and Cromarty, Scotland, 4½ m. W. of Dingwall. It has mineral springs. Pop. 1000.

**Strathspey**, Highland dance derived from the reel, and associated with the Spey valley ('strath'), where it is believed to have originated.

**Stratigraphy**, study of strata, *see under* GEOLOGY, *Historical Geology*.

**Stratocumulus**, *see under* CLOUD.

**Stratosphere**. Normally the temp. of the atmosphere decreases with height, although there may be, depending on the prevailing weather conditions, intervals where the temp. does not change (isothermal) or even increases with height (an inversion). Above some level, known as the tropopause, the isothermal or inversion condition becomes the normal state, this region being known as the S. The region below the tropopause is called the troposphere, and the average decrease or 'lapse' of temp. varies from 1½-2 °C./1000 ft. near the surface to 3 °C./1000 ft. near the tropopause. The tropopause varies in height from about 12 m. in equatorial air to about 5 m. in arctic or antartic air, so that the tropopause (and therefore at least the lower part of the S.) has an approximate temp. varying from -80° C. near the equator to -40° C. in summer and -60° C. in winter near the poles. The cause of these temps. and the sudden change in lapse rate at the tropopause is not yet completely understood. Because it is nearly isothermal vertically the S. is very stable and convection does not occur; only by quasi-horizontal mixing can homogeneity with the troposphere be maintained. For this reason flying conditions in the S. are usually very smooth, there being no cloud and no danger of icing because of the dryness. The S. consists of approximately the same gases as the troposphere (mainly oxygen and nitrogen), but the quantities of both ozone and water vapour are variable. Very few reliable measurements of water vapour have been made in the S. since the only successful instrument at low temps., the Dobson-Brower frost-point hygrometer (*see* HYGROMETER), has to be carried by aircraft, the first measurements being made in 1943: it was then thought that the S. was exceptionally dry with a sudden drop in vapour content at the tropopause, but it has recently been shown that there are also occasions when the vapour content does not drop suddenly. The presence of ozone in the S. has not yet been explained but it is believed that the action of ultra-violet light from the sun upon oxygen at high levels in the S. forms the three-oxygen-atom molecule of ozone which

diffuses slowly to lower levels, the maximum quantity being found between 12 and 20 m. Little is known of the S. at high levels, although there have been Amer. observations using V<sub>2</sub> rockets; these, together with sound-ranging experiments, give estimates of temp. which show a maximum at about 30 m. of 45–50° C., and a minimum at 50 m. of about –70° C., but very variable, probably as much as 25–30° C. change in a day, and 40° C. difference between summer and winter. Prof. S. Chapin, in the *Philosophical Magazine* (Series 7, vol. x., 1930, p. 345) attributes these high temps. to the presence above the ozone layers of one-atom molecules of oxygen which can absorb radiation from the sun, and thus increase in temp. At very high levels (60 m.) the temp. is believed to vary by as much as 100° C. during the day. In the S. winds are mainly westerly, particularly in the lowest levels where 100 m.p.h. is not uncommon, and 200 m.p.h. has been exceeded. Since the temp. varies widely the winds also vary widely. Over S.E. England, at 100,000 ft., the highest level at which winds have been directly measured, R. J. Murgatroyd and C. J. B. Clews found the winds to vary from moderate westerly in winter to light easterly in summer. See also METEOROLOGY. See B. Haurwitz, *The Physical State of the Upper Atmosphere* (reprinted, with addition, from *Journal of the Royal Astronomical Society of Canada*), Toronto, 1941; R. J. Murgatroyd and C. J. B. Clews, 'Wind at 100,000 feet over South-east England,' *Geophysical Memoirs*, vol. x., No. 83, H.M.S.O., 1949, and 'Meteorological Office Discussion: Rocket-sondes,' in *Meteorological Magazine*, vol. lxxviii., March 1949, p. 69.

**Stratton**, urb. dist. (with Bude), and mkt. tn. of N.W. Cornwall, England, 1½ m. E. of Bude, a favourite summer resort. Pop. (estimated) with Bude 5100.

**Stratum**, see under GEOLOGY.

**Stratus**, see under CLOUD.

**Strauss, Johann** (the elder) (1804–49). Austrian dance-composer, b. in Vienna. He founded his own orchestra in 1825, with which he became famous abroad. He composed waltzes, marches, quadrilles, polkas, etc. See lives by R. Kleinecke, 1894, and F. Lange, J. Lanner, and J. Strauss (2nd ed.), 1919.

**Strauss, Johann** (the younger) (1825–1899), Austrian composer, b. in Vienna, son and pupil of the above. From 1849 he led his father's orchestra, giving it up in 1863 to his brothers Joseph and Eduard, to concentrate on composition. He achieved great popularity, and the name of the 'waltz king,' by his romanticist talent, gift for melody and rhythm, and delicate instrumental technique. *The Blue Danube* is perhaps the most famous of his 400 waltzes. His light operas include *Indigo* (1871); *Die Fledermaus* (1874); *A Night in Venice* (1883); and *The Gypsy Baron* (1885). He also composed polkas, galops, and other dances, etc. See lives and studies by F. Lange, 1912; R. von Procházka (5th ed.), 1913; L. Schnitzer, 1920; E. Decsey, 1922; S. Lowy, 1925; K.

Kobald, 1925; H. E. Jacob, 1937; and W. Jaspert, 1939. See also Adele Strauss, *Johann Strauss schreibt Briefe*, 1926.

**Strauss, Richard** (1864–1949), Ger. composer, b. at Munich. He studied under Meyer at Munich, and at twenty-one was appointed assistant conductor to Bulow at Meiningen. Here he met Alexander Ritter, who married Wagner's niece and who won him over from the 'absolute' and classical ideals and style in which S.'s earliest works were composed. S. came to be chiefly associated with the symphonic tone-poem, examples of which are his *Don Juan* (1889) and *Till Eulenspiegel* (1895), these two being usually considered the greatest; *Thus Spake Zarathustra* (1896); *A Hero's Life* (1899), and the *Alpine Symphony* (1923). His chamber music, songs, and pianoforte works are also well known to a limited public, while in contrast his musical comedy *Der Rosenkavalier* (1911) achieved a wide popular fame. S. also did important work in the operatic sphere, and his *Tristan und Isolde* (1912, and rearranged 1917) is highly regarded. The 'orchestral operas' *Feuersnot*, *Salome*, and *Elektra* contain examples of S.'s realism. S. was a natural and fertile musician, a master of orchestration, and a composer able to build gorgeous works, colourful, and rhythmic, out of simple thematic material. Beginning as a romantic, and ending as a classic, he was always a humanist, and the last of the great Ger. composers in that line. His latest works include *Arabella* (1933); *Die Schweigsame Frau* (1935), *Daphne* (1938); *Friedenstag* (1938); *Die Liebe der Danae* (1940); *Capriccio* (1942); *Metamorphosen* (1945); and the charming oboe concerto (1945). See lives and studies by O. Bie, 1906; E. Newman, 1908; M. Steinitzer, 1911; H. T. Finck, 1917; R. Specht, 1921; T. Archer, 1938; J. Gregor, 1939; R. Tenschert, 1944, 1945; W. Schuh, 1947; and H. Ehinger, 1947.

**Stravinsky, Igor** (b. 1882), Russian composer, b. at Oranienbaum, near St. Petersburg. In 1907 he became a pupil of Rimsky-Korsakov. His first composition, a symphony, entirely academic, and his second, a suite of songs called *Le Faune et la bergère*, were performed in 1908. After the death of his master, a new stimulus came from Diaghilev, who produced S.'s ballet *The Firebird* in 1910, his first masterpiece. The ballet *Petrushka* (1911) showed a polytonal effect, but *Le Sacre du printemps* (1913) created new musical values of revolutionary significance. Later works, based on Russian folk songs, included suites and a cantata, *Les Noces* (1923), and *Histoire du soldat* (1918). After the First World War S.'s work shows a new austerity, as in the suite *Pulcinella* (1920), and the one-act opera buffa *Mavra* (1921–22). From 1923 he turned to absolute music in the classical manner as in *Octet* for wind instruments (1923), the oratorio *Oedipus Rex* (1927), and the ballet suite *Apollon Musagètes* (1928), written in America. *Le Baiser de la fée* (1928) and *Capriccio* (1929) filled old forms with new ideas. The *Symphony of Psalms* (1930) expressed a religious aspect of his

later period. A movement towards definite classicism was made in the symphony in C. From 1940 S. settled in the U.S.A. (he became an Amer. citizen in 1945) and in 1942 presented *Dances concertantes*. Later works include *Scènes de Ballet*, 1944, and a symphony in three movements, 1945. S.'s experiments have had a great effect upon contemporaries, and more than any other composer he mirrors in his work the development of modern music. He pub. an autobiography, *About My Life*, in 1936. See studies by B. de Schloezer, 1929; H. Fleischer, 1931; G. F. Mallpiero, 1912; and E. W. White, 1947.

**Straw**, stalk or stem of various corn crops such as wheat, barley, oats, rye, maize, leguminous crops, and also flax and hemp.

**Strawberry**, fruit, or, more correctly, cluster of achenes surrounding the juicy receptacle, of various species of the genus *Fragaria* (family Rosaceae). The fruit of the wood S. (*F. vesca*), the only Brit. species, is small but very delicately flavoured. The hauthoy S. sometimes grows wild, but is a garden escape. From it and the Chile S. (*F. chiloensis*) and scarlet S. (*F. virginiana*) the cultivated varieties are mostly derived.

**Strawberry Hill**, see under TWICKENHAM.

**Strawberry Tree**, see ARBUTUS.

**Strawboard**, see CARDBOARD.

**Streaming**, see under MINING.

**Streatham**, residential suburb in the metropolitan bor. of Wandsworth and co. of London, 6 m. from St. Paul's. It was once a spa noted for medicinal springs that were the resort of rank and fashion at the beginning of the eighteenth century. It has a fine common of 60 ac. The site of Thrule Park where Johnson used to visit is in S. Park, but its family mansions in large gardens have been replaced by the amenities of modern community life. S. contains the Brit. Home for Incurables (1894) and a Magdalen hospital. The par. church registers go back to 1538 inclusive, but the first historical mention of S. is the record of a joint deed of gift made in A.D. 675 by which Chertsey Abbey was endowed with lands at 'Toting cum Stretham.'

**Streator**, city of LaSalle co., Illinois, U.S.A., on Vermilion R., 50 m. N.E. of Peoria. It is a railway and agric. centre, and has important manufs. and coal mines. Pop. 16,000.

**Street**, tn. and urb. dist of Somersetshire, England, near to Glastonbury. Shoes and leather board are made. Pop. 3500.

**Street-cars**, see TRAMWAYS.

**Streicher**, Julius (1891-1946), Ger. politician, b. at Fleinhausen. After the First World War he began a violent anti-Semitic and nationalistic movement at Nuremberg. His insignificant party of 'Ger. Socialists' then got into contact with Hitler's National Socialists at Munich, and from 1922 S. and Hitler became firm friends. After Hitler was released from Landsberg prison he made S. Gauleiter at Nuremberg. He founded a special weekly paper for 'the struggle for truth against

traitors' entitled *Der Stürmer*, at first, concerned mainly with scandal and gossip, but soon specialising in Jew baiting. After Hitler's triumph in 1933 S. was able to fill the role of tyrant. The views of the *Stürmer* soon prevailed throughout Germany, and when Hitler decided on boycotting Jewish shops S. was made Aktionsführer (riot leader). Later he became governor of Franconia. S. was sentenced to death at the Nuremberg trial (q.v.) and executed.

**Strelitzia**, genus of Musaceae which occurs exclusively in Africa, and contains only five species. *S. reginae* is known as the queen's-flower, bird's-tongue flower, or bird-of-paradise flower, because of its showy orange and blue colours.

**Streltsi**, or **Streltsy**, see RUSSIA. *History*.

**Stremonius, St.**, see AUSTREMOINE.

**Strength of Materials**. Substances used for building purposes, such as wood, metal, etc., have a certain limit of resistance, and yield to stresses and strains of various kinds. The study of this limit falls under the above head. The amount of stress and strain that a substance will withstand before it breaks can only be determined by elaborate experiments on that substance with specially designed apparatus. Before making a structure it is necessary to know the kind and amount of stress to be laid on it. This known, the engineer must use material of sufficient strength and of suitable size and shape to resist this stress. There are four strains which a material may undergo, namely: (1) extension; (2) bending; (3) twisting; (4) compression. Whatever combination of these strains there may be there are really only three resistances called into play, namely: (1) the tenacity of the substance, i.e. the resistance to extension; (2) the resistance to shearing strain (see ELASTICITY); and (3) the resistance to compression or crushing. For many substances (1) and (3) are the same, but for others, notably cast iron, the resistance to crushing is much greater than the tenacity. For engineering purposes the different strengths are classified under the following heads: (1) tenacity; (2) resistance to bending; (3) resistance to twist; and (4) resistance to thrust, i.e. resistance to a pressure applied at both ends. This is really a combination of a resistance to bending and a resistance to compression.

**Streptocarpus**, genus of Gesneriaceae, found in Africa. It contains thirty species, usually known as Cape primroses, which are downy herbs, bearing beautiful flowers generally of a purple or blue colour.

**Streptococci**, see BACTERIA.

**Streptomycin**, see under PENICILLIN and TUBERCULOSIS.

**Stresa**, vil. and health resort in Novara, Italy, on the W. shore of Lake Maggiore, and on the Simplon Railway, 75 m. N.E. of Turin. S. was the scene of two international conferences. (1) In Sept. 1932, a conference of fifteen European states to discuss the economic and financial recovery of central and E. Europe; (2) In April 1935. See EUROPE (HISTORY), *Stresa Conference*.



**Stresemann, Gustav** (1878-1929). Ger. statesman; *b.* in Berlin, of a family of brewers with Liberal traditions in politics. He attended the Andreas Realschule in Leipzig and Leipzig Univ. At twenty-four he founded the Union of Saxon Industrialists, an association of the smaller textile manufacturers. At twenty-eight, as a National Liberal, he entered Parliament; and, until his death, he was out of it only for a brief period, 1913-14, when he travelled. During the First World War he was an annexationist. In 1917 S. became leader of the National Liberals. After the revolution of 1918 he led a section that became the Ger. People's party. Though a monarchist, in Aug. 1923 he became chancellor of the republic, being later succeeded by Wilhelm Marx. He was foreign minister in various govts. until his death. In 1925, for the satisfaction of France, S. proposed a security pact, which was made at Locarno in Oct. At the general election of 1924, his old allies the Nationalists having opposed the Locarno pact, he came out as a supporter of the republic. In March 1926 he was at Geneva, expecting that Germany would be admitted into, and also be put on the Council of, the League of Nations. He was there again in Sept., when that end was achieved. He made Germany the first great power to adopt The Hague Statute's 'optional clause' for universal arbitration, and accepted the Amer. proposals to outlaw war. S. shared the Nobel peace prize with Brandt in 1926. The main object of his policy in the last three years of his life was to secure the evacuation of the Rhineland in return for Ger. acceptance of a reparations settlement, and this was the central theme of his discussion with Brandt at Thoiry. He lived to see his plans brought to a successful issue at The Hague in 1929. But as regards the E. European question S. had no plan for the final adjustment of Ger.-Polish relations. His essays and speeches were pub. in Eng. trans. by C. R. Turner (1930), and his diaries, letters, and papers, ed. and trans. by E. Sutton, 3 vols. (1940); see also Baron von Rheinbaben, *Stresemann*, 1929; R. Olden, *Stresemann*, 1930; and W. Gorch, *Gustav Stresemann*, 1947.

**Stress**, see STRAIN.

**Stretchers**, see BRICKWORK.

**Stretford**, municipal and parl. bor. of Lancashire, England, 2 m. S.W. from Manchester. S. lies in the heart of the industrial N., and has a large part of the great industrial estate of Trafford Park within its boundaries. The tn. is served by the Bridgewater and Manchester Ship Canals. Trafford Park was the ancestral home of the de Trafford family for nearly a thousand years, tradition claiming that the family was settled there in the reign of Canute. In the Middle Ages weaving and papermaking were carried on in S., and in the eighteenth century pig-killing was a well-estab. local trade, earning the dist. the name of Porkhampton. In 1933 S. was made a municipal bor. by the grant of a royal charter. At Old Trafford are situated the headquarters of the Lancashire Cricket Club. In 1896 Trafford

Park Estates Ltd. was formed to undertake industrial development, and to-day, with its position on the Manchester Ship Canal, the area has become one of the greatest industrial estates in the world. It contains 200 factories, and among its many industries are numbered those of electrical, mechanical, automobile, and sanitary engineering, farm machinery, metal casting, brass founding, food manufs., lead mills, gear works, timber yards, saw-mills, chemical works, die-casting, printing, flour milling, sheet metal works, ship repairing and building, abattoirs, bacon and gut manufs., and asbestos works. Pop. 61,500.

**Stretto**, see FURGE.

**Strickland, Agnes** (1796-1874). Eng. historian, *b.* near Southwold, Suffolk. She wrote in 1833 *Historical Tales of Illustrious British Children*, and also for the young, *Tales and Stories from History* (1836). Her best-known and more famous work, written in collaboration with her sister Elizabeth, is the *Lives of the Queens of England* (1840-48, from which was derived *The Life of Queen Elizabeth*, Everyman's Library, 1906); followed, amongst others, by *Lives of the Queens of Scotland and English Princesses connected with the Royal Succession of Great Britain* (1850-1859) and *Lives of the Last Four Stuart Princesses* (1872).

**Stricture**, narrowing of a canal in the body by inflammatory or other changes in its walls. The term is most commonly used of urethral S., caused by ulceration due to gonorrhoeal infection. The S. should be kept open by occasionally passing a bougie into the channel. S. of the oesophagus can be treated by dilatation with a bougie unless it is due to malignant ulceration, when food must be administered *per rectum* or directly into the stomach. Malignant S. of the intestines is met by short-circuiting or by cutting out the affected portion.

**Strigidae**, see OWLS.

**Strike, General The** (1926), 'sympathetic' strike by the trade unions of Great Britain undertaken in support of the Miners' Federation in their dispute with the coal-owners. In consequence of the obviously unsound condition of the coal-mining industry the gov. had in 1925 granted the owners a year's subsidy to enable them to carry on without insisting upon a reduction in miners' wages, at the same time setting up a commission under the chairmanship of Sir Herbert (later Viscount) Samuel to inquire into the state of the industry. The commission recommended (March 6) that a scheme of reorganisation of the industry be put into operation as soon as practicable. The gov. subsidy was due to expire in May 1926, and the owners posted notices of this and of their intention not to continue to employ the miners thereafter except at lower rates, but they made no definite proposals until after the expiry of the notices, and then did not include any plans for substantial reorganisation. In consequence the T.U.C. called a conference of its constituent unions and reported that it could see no alternative

to a general sympathetic strike as a means of furthering the miners' cause. The executives resolved that a strike be called as from midnight May 3-4.

The vast majority of the organised workers ceased work, though the essential services were partially carried on by volunteers acting upon plans outlined by the gov. In the light of the experience of the miners' strike of 1919 and the railway strike of 1920. There was a general absence of disorder, and no concerted attempt to effect a political coup. In the absence of newspapers, the gov. took control of the radio, and issued a journal of its own, the *British Gazette*, whilst the T.U.C. pub. the *British Worker*. Sir H. Samuel was invited by a negotiating committee (which included miners' representatives) to interpret certain parts of the report of his commission and to act as mediator. The Samuel memorandum was prepared as a basis of settlement and accepted by the T.U.C. in the belief that it would be acceptable to the gov., but when it was presented to the executive of the Miners' Federation they refused its terms, notwithstanding that it had the backing of their own representatives on the negotiating committee. The T.U.C. feeling that the other unions had gone as far as they could in supporting the miners, advised the executives of its constituent bodies to call the strike off, and it ended inconclusively on May 13.

The legality or illegality of the G. S. was widely discussed, and Sir John Simon in particular put forward a closely reasoned argument for its illegality. This view found no general support amongst lawyers and the fact that it was considered necessary to make sympathetic strikes illegal by the Trade Disputes Act (*q.v.*) (repealed by the Labour Gov. in 1946) appears to afford evidence that the G. S. was not contrary to law. The G. S. involved over 2,000,000 employed persons, and caused the loss of about 162,000,000 working days.

**Strikes and Lock-outs.** A strike is defined as the cessation of work by employed persons acting together or their refusal to continue work in order to compel their employer(s), or to aid other employed persons to compel their employer(s), to accept or not to accept terms or conditions of or affecting their employment. A lock-out is the refusal of an employer, by means of closing the place of employment, to continue to employ persons normally employed by him in order to compel them, or to aid other employers to compel persons employed by them, to accept terms or conditions of or affecting their employment. A strike or lock-out is a legal act as part of a trade dispute within the Trade Disputes Act, 1906, *i.e.* a dispute between employers and workmen or between workmen and workmen connected with the employment or non-employment of particular persons or with terms and conditions of employment. The average number of stoppages due to S. and L. each year was 859 for the years 1918-26, 903 for 1927-45, and 1777 for 1946-49. The average number of work-

people involved each year was 1,354,000 for the years 1918-26, 371,000 for 1927-1945, and 503,000 for 1946-49. The average number of working days lost each year was 4,268,000 for the years 1918-26, 2,765,000 for 1927-45, and 2,086,000 for 1946-49. The averages for the years 1918-26 include figures for the General Strike (*see* STRIKE, GENERAL THE. *See further under* LABOUR DISPUTES. *See also* INDUSTRIAL RELATIONS; LABOUR LEGISLATION; TRADE DISPUTES ACTS; TRADE UNIONS; *also* UNITED STATES, *Industrial Relations and History*.

**Strindberg, Johann August** (1849-1912). Swedish novelist, dramatist, poet, and essayist, *b.* in Stockholm. The poverty, repression, and unhappiness of his childhood explain something of his later development. He studied at Uppsala Univ., interrupting his career there for a time for financial reasons. From 1874 to 1882 he was an assistant at the Stockholm Royal Library.

S. was an extremely prolific author. His novel *The Red Room* (1879, trans. 1913) was acclaimed as Scandinavia's first realist-social novel. He was influenced at this time by Dickens, the Goncourts, and possibly Flaubert; to these he added his own bitter, penetrating observations on humanity. He adopted much of Nietzsche's doctrine, being one of the supreme examples of the Idealist literature, though his Idealism was distorted by his extreme, introspective pessimism. S. was thrice married and divorced; his hatred of women and peculiar conception of paternity, seen in embryo in *The Red Room*, and becoming almost maniacal in the collections of short stories, *Marriages* (1884, 1885), and the plays *The Father* (1887, trans. 1907), and *Miss Julie* (1888, trans. 1911) had their origin in his own abnormality and acute inferiority complex, and eventually became an obsession. He spent some time in a mental sanatorium. S. never fully recovered from the breakdown he suffered when prosecuted for blasphemy on the pub. of *Marriages*. In later years he turned from Nietzschean Idealism to evolve a religious mysticism, which found expression in the dramatic trilogy, *To Damascus* (1898 1904, trans. 1933 35). He may have been influenced by Swedenborgianism, but dramas such as *The Spook Sonata* (1907, trans. 1916) show a dabbling in the psychic and the occult.

S. was Sweden's greatest dramatic artist, and possibly her greatest literary figure. The dramatic construction of his plays is superb. He was a very versatile artist: the years which produced his angry masterpiece, *The Father*, produced also the charming tale, *The Duellers of Hemso* (1887) and he wrote sev. travel sketches and light essays. *See* lives by A. Jollivet, 1931, and Frida Strindberg, 1936. *See also* C. E. W. L. Dahlstrom, *Strindberg's Dramatic Expressionism*, 1930, and H. Taub, *Strindberg als Traumdichter*, 1945.

**Stripes and Chevrons**, devices worn on the sleeves of uniformed forces to indicate rank, conduct, or some other attainment. The Fr. adopted stripes to indicate the

rank of non-commissioned officers towards the end of the eighteenth century, a practice which was copied by the Brit. some years later. Chevrons, to indicate periods of good conduct, were instituted later. Stripes are V-shaped, whilst chevrons are A-shaped. In 1916 a system of indicating that a soldier had been wounded in the First World War was introduced which consisted of a perpendicular stripe of gold wire worn on the left sleeve. A stripe was worn for each occasion of being wounded. In the Brit. service a red worsted chevron was worn on the right sleeve by all ranks who served overseas during 1914 and a blue one for each year of service overseas after 1914. In the U.S.A. overseas chevrons are still worn: they are A-shaped and are worn near the left cuff. A chevron was granted for each period of service of six months in the European zone. Rank chevrons (A) in the U.S. Army are worn as follows: master sergeant, three stripes and an arc of three bars (chevron for first sergeant includes a diamond in the field); technical sergeant, three stripes and an arc of two bars; staff sergeant, three stripes and an arc of one bar; sergeant, three stripes; corporal, two stripes; first-class private, one stripe. In the Brit. service good conduct badges are not worn by corporals and higher ranks. In the foot guards lance-corporals wear two stripes (the same as full corporals in other arms), but with good conduct stripes.

**Strobilanthes**, large genus of Ruellieae. *S. flaccidifolius*, growing in Assam and Burma, yields a blue dye. *S. dyerianus*, cultivated in Britain, is a dwarf evergreen shrub, with long indurated leaves, purple beneath with violet flowers in spikes.

**Stroboscope**, device for causing a moving object to appear stationary, utilising the optical phenomenon of stroboscopic effect. The S. consists either of a shutter or of a means of illumination by a series of light flashes, so arranged, that at a given point when viewed or illuminated is in the same position at each occurrence. Machinery in motion is examined by this method.

**Stromboli**, see under LIPARI ISLANDS.

**Stromness**, burgh, mkt. tn., and seaport on the S.W. of Mainland (Pomona), Orkney Is., Scotland, 14 m. W. of Kirkwall. S. Harbour (W.), lying N. of Hoy Sound, is the best in N. Scotland. Pop. 1500.

**Strong, Emilia Frances**, see DILKE, LADY.

**Strong, Leonard Alfred George** (b. 1896), Eng. writer and poet, b. at Plympton in Devon, of W. country and Irish parentage, educated at Plymouth, Brighton, and Wadham College, Oxford. He was for twelve years a teacher, in 1930 becoming a free-lance journalist and writer. His first vol. of verse, *Dublin Days*, was pub. in 1921. His work includes poetry, biography, short stories, belles-lettres, and many novels, and he has ed. a series of one-act plays for Methuen & Company Limited, of which he is a director. He is also a lecturer and broadcaster.

**Strongbow**, name of Richard de Clare,

second earl of Pembroke (d. 1176), who joined Dermot, king of Leinster, in the latter's recovery of his kingdom from the king of Connaught, married his daughter, and succeeded him. In 1172 he acknowledged Henry II.'s overlordship. He did much to increase Eng. power in Ireland.

**Strontium**, metallic chemical element, symbol Sr, atomic number 38, atomic weight 87.6. It occurs in nature as strontianite ( $\text{SrCO}_3$ ) and celestine ( $\text{SrSO}_4$ ). The metal is obtained by the electrolysis of the fused chloride and is white in colour. It readily oxidises in air and decomposes in water at ordinary temps. (melting-point  $800^\circ \text{C}$ , sp. gr. 2.5). Heated in hydrogen it forms a hydride ( $\text{SrH}_2$ ) which when heated *in vacuo* yields pure S. Two oxides of S. are known, the monoxide and dioxide. The monoxide, strontia, slakes like lime, forming S. hydroxide ( $\text{Sr(OH)}_2$ ). Excepting the sulphate, carbonate, and phosphate, the salts of S. are soluble in water. They impart a crimson colour to the flame, and are therefore used in pyrotechny. The hydroxide is largely used in the manuf. of beet sugar.

**Stroud**, dist. of Rochester, Kent, on the l. b. of the Medway.

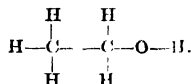
**Strophanthus** (Gk. *στροφος*, cord; *ανθος* flower), genus of Apocynaceae, the species of which are found from S. Africa to China. There are over twenty of these, and they consist of small trees or shrubs bearing peculiar flowers which have long and thread-like lobes on their petals. *S. hispidus* yields the *uñe* poison, and the seeds are used in pharmacology to stimulate the action of the heart. *S. sarmentosus* yields an acid from which cortisone may be produced for use in the treatment of arthritis.

**Strophe** (Gk. *στροφή*, a turning), term used in versification to denote a collection of prosodical periods, combined into a structural unit. It derives from a movement of the Gk. chorus. See ANTI-STROPHE.

**Stroud**: 1. Tn. of Gloucestershire, England, on the W. Region main line from London, 8½ m. S. by E. of Gloucester. For many centuries broadcloth and scarlet-dyed cloth have been manufactured in the neighbourhood. There are also breweries, saw-mills, and manufs. of plastics and fibre board. Pop. 45,000. 2. Tn. of New S. Wales, in Gloucester co., 113 m. N. of Sydney by rail. There is a goldfield near by. Pop. 1100.

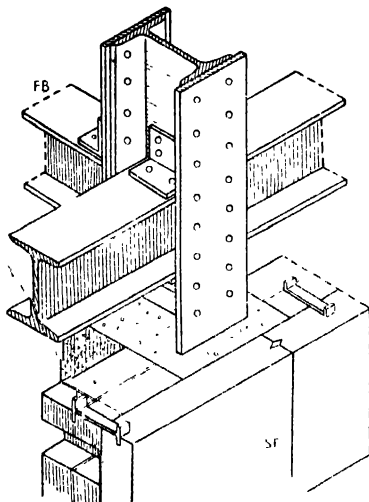
**Stroud Green**, N. suburb of London, on N. by W. of St. Paul's.

**Structural Formulae**, in chem. are formulae expanded in such a way as to represent what are believed to be the relative arrangements of the atoms in a molecule. Thus the S. F. of alcohol,  $\text{C}_2\text{H}_6\text{O}$ , is  $\text{CH}_3\text{—CH}_2\text{—OH}$ . Further expansion gives a *graphic* formula, e.g.



**Structural Steelwork**, steelwork applied to buildings and to engineering structures

other than bridges. After the successful use of cast iron in bridge-building in the latter half of the eighteenth century, builders began to make use of this metal for columns and, later, to replace timber, for beams carrying the floors of large buildings, such as factories. By the end of the century good-quality wrought iron was being produced, and this was used in the form of rolled 'I' sections for beams in place of cast iron, which, however, was retained for the compression members. The use of wrought iron in this way made it possible to construct much lighter and stronger structures than was possible with



STRUCTURAL STEEL WALL  
FB, floor beam SF, stone facing

cast iron. The first rolled-steel joist was made in England in 1855, but in spite of the low cost of production of steel by the Bessemer and Siemens-Marten processes of manu., it was not commonly used in structural engineering in Britain until some thirty years later. Steel used in modern S. S. is rolled into lengths which have 'I,' 'T,' angle, rectangular, channel, or other cross-sections. The dimensions of these various sections are standardised, and, for the convenience of the designer, the properties of the standard sections are available in the form of tables in engineering handbooks. Broadly, the procedure is to build up a steel frame or skeleton which will carry the loading and transmit it to the foundations, the various members being usually riveted together, though welded joints are coming increasingly into use. As the walls are chiefly weather screens, and contribute little to the strength of the structure, there is no need for them to be thick or heavy, thus saving weight and, in the case of high buildings,

floor space. They are built into the framework. This system of building lends itself to speedy construction, because when the frame is complete work can proceed simultaneously on sev. floor levels. By the use of standard details and connections much economy is effected both in the drawing-office and on the job. The unit stresses observed in Britain are commonly limited to  $7\frac{1}{2}$  tons per square in. safe load. Owing to the increased height of buildings, particularly in U.S.A., special attention must be paid to the foundations. For this purpose piles or steel caissons are sometimes required or a complicated arrangement of joist, or 'grilles,' used to spread the weight. In special cases, where the property limits require it, stanchions are supported on the projecting ends of cantilever beams properly secured for stability. In all tall and narrow buildings wind effects have to be provided for by diagonal bracing or by stiffening knees between floor girders and uprights. The walls themselves also help to preserve the rigidity of the structure and prevent vibration due to wind pressure. Steelwork alone, although not combustible, cannot be considered immune from fire. Due to the distortion of the metal framework consequent upon the heat, steel buildings have been known to collapse; therefore it is good practice to encase the steel in concrete, terra-cotta, or other fire-resisting material. Another point which must not be overlooked in steel-framed structures is corrosion. Experience gained from an examination of buildings which have been demolished shows that when encased in concrete the tendency of the steel to corrode is negligible. Rust is also prevented by the use of good quality paints. In recent years reinforced concrete (*q.v.*) has proved a serious rival to S. S. See A. Morley, *Strength of Materials*, 1916; J. Husband and W. Harby, *Structural Engineering*, 1928; E. A. Salmon, *Materials and Structures*, 1931; and A. J. S. Pippard, *Analysis of Engineering Structures*, 1936.

**Struensee, Johann Friedrich, Count** (1737-72), Dan. statesman, *b.* at Halle in Saxony. He studied medicine, and in 1768 was appointed physician to the King of Denmark, whom he accompanied on his tour to Germany, France, and England. In 1771 he became minister of state, and carried out many reforms. His policy, his foreign birth, and his suspected liaison with Queen Carolina Matilda, brought about his downfall, and he was executed for treason. See lives by V. Lange, 1926, and J. M. Wehner, 1938.

**Struma** (Turkish *Kara-Su*), riv. of Bulgaria and Macedonia, rising in the former and flowing into the gulf of Rendina.

**Struma**, see under GOUTRE.

**Struma**, see SCROFULA.

**Strutt, John William, and Robert John**, see RAYLEIGH, BARON.

**Stry**, or **Stryj**, tn. in the Ukrainian S.S.R. (formerly in Poland), on the R. Stryj, 41 m. S.W. of Lvov. There are railway repair shops, metal industries, and the manu. of matches. Pop. 30,700.

**Strychnine** ( $C_{21}H_{22}O_2N_2$ ), alkaloid occurring in *Strychnos nuxvomica*, *S. colubrina*, *S. ignatii*, *S. tecta*, and other trees of the same genus. The alkaloid is contained with brucine in the bark, leaves, seeds, and root. S. is a crystalline solid. Insoluble in water, but soluble in alcohol and chloroform. It has an alkaline reaction and a bitter taste; optically it is levo-rotatory. The alkaloid and its salts are used in medicine as tonics and stimulants. It is especially employed in collapse from alcoholism, pneumonia, emphysema, etc., the dose being under .5 grain. In larger doses it acts as a powerful poison, one grain being a fatal dose in many instances. The symptoms of poisoning commence with a stiff neck, and shortly the patient is seized with tetanic convulsions, the muscles being contracted for a minute at a time; often the body is thrown into the form of an arch, the patient resting on his head and heels. The treatment must commence with emptying the stomach with an emetic or the stomach-pump. Chloral and potassium bromide have been found useful in counteracting the spasms.

**Strychnos Nuxvomica**, Indian tree of the order Loganiaceae. It contains sev. alkaloids, the chief of which are strychnine (*q.v.*) and brucine.

**Stryl**, riv. of the Ukrainian S.S.R. rising in the Carpathians and flowing into the Dniester.

**Stuart, Arabella**, or **Arbella** (1575-1615), only child of Charles S., duke of Lennox, younger brother of Henry, Lord Darnley, the father of James I. James and she, therefore, were full cousins, and she was, before the birth of his son Henry, in Feb. 1594, the next in order of succession to the Eng. throne to James. Her name was brought forward in 1603, after the accession of James, in the affair of the alleged plot called 'the Mam,' for which Sir Walter Raleigh was tried. One of the charges against Raleigh was that he designed to raise the Lady Arabella to the throne, under the protection of Spain. There is no probability that any such design ever was entertained. Her situation, however, was a difficult and dangerous one. She was secretly married to Wm. Seymour, second son of Lord Beauchamp, the eldest son of the earl of Hertford; but it was discovered in 1610, and Seymour and the lady placed in separate confinement. Arabella escaped from Highgate and Seymour escaped from the Tower. Seymour reached Flanders in safety, but Arabella was captured in Calais Roads and placed in the Tower, where she died. See E. T. Bradley, *Life and Letters*, 1889.

**Stuart**, or **Stewart, Charles Edward Louis Philip Casimir** (1720-88), known as the 'Young Pretender,' being the elder son of the Chevalier de St. George, the 'Old Pretender,' born in Rome. He served in the wars of the Polish and Austrian Succession, distinguishing himself when very young at Gæta (1734) and Dettingen (1743). In 1743 he headed an unsuccessful Fr. invasion of England, but in 1745 succeeded in landing at Eriska in the Hebrides. Marching southwards he entered Edinburgh and held his court at

Holyrood. He defeated Cope at Prestonpans. With a troop of 6500 men he invaded England, and marched as far S. as Derby, when his advisers, seeing no prospect of success, urged him to retreat to Scotland. There he was again victorious at Falkirk (1746), but was overwhelmed by Cumberland at Culloden, and for many months hid in the fastnesses of the Highlands with a price of £30,000 on his head. Before the end of the year he escaped to France, whence he was expelled in 1748. He spent the remainder of his life as a fugitive on the Continent, living for some time in Rome. He married Louisa von Stolberg in 1772. See lives by A. C. Lwald, 1875; A. Lang, 1900; and W. D. Norrie, 1903-4; C. Mackenzie, *Prince Charles and his Ladies*, 1934; D. Nicholas, *The Young Adventurer: Prince Charles and the '45*, 1949; E. M. Porcelli, *The White Cockade: Adventures of Bonnie Prince Charlie*, 1949; and Sir C. Petrie, *The Jacobite Movement: the Last Phase*, 1950.

**Stuart**, or **Stewart, Henry Benedict Maria Clement**, Cardinal York (1725-1807), called by the Jacobites Henry IX., the second son of the 'Old Pretender.' He took part in the rising of 1745, and on his return to Italy became bishop of Ostia and cardinal (1747), archbishop of Corinth (1759), and bishop of Tusulum (1761).

**Stuart, House of**, see STUART.

**Stuart, James (c. 1531-70)**, see MORAY, EARL OF.

**Stuart, James (d. 1596)**, see ABERN, EARL OF.

**Stuart, James Francis Edward** (1688-1766), Prince of Wales, commonly styled the 'Chevalier de St. George' and later known as the 'Old Pretender,' the son of James II. by his second wife, Mary of Modena. The prince was born in June, and in Dec., when the king had decided to fly the country after the landing of the Prince of Orange, he was taken to France. In 1701 James II. died, and his son was accepted by the Jacobites as king of England under the style of James III. He served with distinction in the Fr. Army before the peace of Utrecht, and in 1715 went to Scotland to take part in the unsuccessful Jacobite rising. He married Maria Clementina Sobieski in 1719. The rising of '45 was the last attempt to secure his restoration. See T. P. Henderson, *The Royal House of Stuart*, 1914, and G. N. Clark, *The Later Stuarts, 1660-1711*, 1934.

**Stuart, John**, see BUTE, EARL OF.

**Stuart, Leslie** (real name Thomas A. Barrett) (1866-1928), Eng. organist and composer, b. at Southport. He was organist at Salford and in Manchester, and from 1895 was in London. He composed popular songs and operettas, of which *Floradora* (1899) was the best known.

**Stuartia**, camellia-like deciduous shrubs of the order Trostrodiumaceae, having creamy or white flowers. The three species grown are pentagyna, pseudocamellia, and virginica. Propagation is by layering.

**Stubbs, George** (1724-1806), Eng. painter, b. in Liverpool, studied anatomy

and became a lecturer at York hospital. He was well known for his sporting pictures, and became A.R.A. in 1780. There are examples of his work in the Victoria and Albert Museum and the National Gallery. S. pub. *The Anatomy of the Horse* (1786), illustrated by his own engravings.

**Stubbs, William** (1825-1901), Eng. historian and churchman, b. at Knaresborough, and educated at Ripon Grammar School and Oxford. From 1850 to 1866 he held the living of Navestock, Essex, and was then appointed prof. of modern hist. at Oxford. In 1884 he was consecrated bishop of Chester, and five years later translated to the see of Oxford. His chief pub., *Constitutional History of England* (1874-78), is a work of monumental scholarship. His *Select Charters to 1307* (1870) have been pub. in many eds., and he contributed valuable introductions to the Rolls series of nineteen vols. of chronicles (A. Hassall, ed. 1902). His letters were ed. by W. H. Hutton (1904).

**Stucco**, It. word applied in most languages to plaster of any kind used as a coating for walls to give them a finished appearance. Stucco work or *stuccatura* is interior ornament in imitation of carved stone.

**Stuerbout**, see BOUTS, DIEBICK.

**Stuffing**, see TAXIDERMY.

**Stuka**, Ger. term for dive-bomber, particularly applied to the Ju. 87 and the Ju. 87b. The former, a twin-seat monoplane with fixed undercarriage, had a speed of about 200 m.p.h., and was used in close co-operation with armoured formations as, for example, in Poland and in France in 1940. The bomb load was some 1000 lb. It was also used against aerodromes, shipping, and other specific targets.

**Stukeley, William** (1687-1765), Eng. antiquary, one of the founders of the Society of Antiquaries, an exponent of Neo-Druidism, practised as a doctor in Boston (Lincolnshire), London, and Grantham, and after 1729 was successively vicar in Stamford, Soмерby, and Queen Square, London. He pub. *Stonhenge, a Temple Restor'd to the British Druids* (1740) and *Abury* (Avebury, q.v.) (1743). See S. Piggott. *William Stukeley, an Eighteenth-century Antiquary*, 1950.

**Stupor**, term used to describe states of partial insensibility. Its difference from true coma is one of degree and in severe cases its diagnosis from the latter may present some difficulty. Broadly speaking, in S. the causative condition only produces a dulling (sometimes, indeed, to a very considerable degree) of consciousness in contrast to the total loss that is present in coma. In the type of S. met with in cases of mental disease, the total absence of feeling and emotion is often more apparent than real: many patients who during their illness displayed indifference to their condition and environment, seemingly amounting at times to complete unawareness, and who exhibited no evidence whatever of spontaneous activity, give after recovery a detailed and vivid account of all they have experienced.

In the literature of psychological medicine various attempts have been made to classify S., e.g. as (1) anergic and (2) restive, or (a) benign, (b) depressive, (c) katatonic, and (d) maniacal. See also UNCONSCIOUSNESS.

**Sturgeon**, fish which constitute the family Acipenseridae in the order Chondrostei. They are large and have elongated bodies, bearing five rows of large bony scutes; the mouth is small, has no teeth, and in front of it are four barbels. S. are voracious feeders on small animals and plants. Caviare is made from the ovaries and isinglass from the air-bladders of sev. Russian and Amer. species. Of the twenty or so species only *Acipenser sturio* is occasionally found off Brit. coasts. The S. is fish royal.

**Sturgeon Bay**, vil. in Door co., Wisconsin, U.S.A., 7.5 m. N.E. of Appleton, on the E. of Green Bay, Lake Michigan. There is a harbour and lumber mills.

**Sturla Thorðsson**, see THORÐSSON.

**Sturluson**, or **Sturlason**, see SNORRI STURLUSON.

**Sturm**, St. (d. 779), first Ger. to become a Benedictine, a favourite disciple of Boniface. He chose the site of Fulda, and became abbot there. He was regarded as second only to Boniface as apostle of Germany.

**Sturm und Drang**, see GERMANY, *Literature and Literature*.

**Stuttering**, see STAMMERING AND STUTTERING.

**Stuttgart**, cap. of Württemberg-Baden, Germany, formerly cap. of Württemberg, on the Neesenbach, an affluent of the Neckar, 127 m. S.E. of Frankfurt. It occupies a picturesque position in a valley surrounded by vine-clad hills, and further off by wooded mts. The chief features of interest included three late-Gothic churches, a sixteenth-century castle, a sixteenth- and an eighteenth-century palace, the Akademie (once the seat of the Karlschule), containing the library. S. became a tn. in 1250, and from the fifteenth century was the cap. of the Württemberg dukes and kings. The city is a centre of the printing and publishing trades, and is noted for the Daimler-Benz motor works, and chemical, electrical, and textile products. The tn. was heavily bombed during the Second World War. In the allied advance of 1945 the First Fr. Army occupied S. on April 22. Pop. (1939) 460,000.

**Stuyvesant, Peter** (1592-1672), Dutch colonial governor, became director-general of the New Netherlands in 1646, until the surrender of New Amsterdam (New York) to the Eng. in 1664. He spent his later years in New York, and his farm (Bowery) gave its name to the Bowery.

**Stye**, or **Hordeolum**, inflammation of the modified sweat glands between the eyelashes. It commences with a hardening of the skin about the part, followed by swelling and soreness. Suppuration of the lower layers of the skin next takes place, and the central core subsequently sloughs off. Gentle fomentation tends to ease inflammation; care should be taken not to irritate the conjunctiva. Refractive

defects in the eyes are often factors in the incidence of S.

**Style, Old and New**, see CALENDAR.

**Stylites, St. Simon, or Simeon** (Gk. *στυλῖτης*, pillar), monk of Syria in the fifth century, who spent the last thirty years of his life on a pillar, 72 ft. high and 4 ft. square at the top, erected near Antioch. He preached by day, and crowds of pilgrims flocked to receive his exhortations. He died in 459 at the age of seventy-two.

**Styria** (Ger. *Steiermark*), former duchy and crownland of Austria, later a prov., bounded by Upper and Lower Austria (N.), Burgenland (E.), Yugoslavia (S.), and Carinthia and Salzburg (W.). Its surface is diversified by the outlying spurs of the E. Alps, the Dachstein (9830 ft.), Hochgolling (9390 ft.), Predigtstuhl (8349 ft.), Grosser Rosenstein, and the Eisenhut reaching the highest elevations. The chief rvs. are the Enns in the N.W. and the Raab and the Mur in the central dists. Half the prov. is still forest land, and maize, oats, rye, and roots are cultivated. There are rich deposits of iron ore, graphite, and lignite, and iron and steel goods are manufactured. Eisenitz, Leoben, Koflach, and Vordernberg are centres of mining dists. There is a univ. at Graz, the cap. S. formed part of the Rom. prov. of Noricum. In the sixth century A.D. there was an influx of Slovenes. Ottokar, count of Steyr, gained possession of the area in 1056, it became a dukedom in 1180, passed to Austria in 1192, to Ottokar II. of Bohemia in 1260, and to the Hapsburgs in 1282. S. suffered from the Turks, and from religious disputes. In 1918 Yugoslavia received the S. dists. occupied by Slovenes, and raised further claims after the Second World War. Area 6326 sq. m. Pop. 1,280,000.

**Styx**, in Gk. mythology, the name of the prin. riv. in the nether world, around which it flows seven times. S. is described as a daughter of Oceanus and Tethys. As a nymph she dwelt at the entrance of Hades, in a lofty grotto supplied by silver columns. As a riv. S. is described as a branch of Oceanus, flowing from its tenth source; and the R. Cocytus again is a branch of the S.

**Suabia**, see SWABIA.

**Suaheli**, see SWAHILI.

**Suarez, Francisco** (1548-1617), Sp. philosopher and theologian, b. at Granada, entered the Society of Jesus as a student at Salamanca, 1564. He became prof. of theology at Coimbra (1597 onwards). He became leader of a school of neo-scholastics, opposed to the Thomists. His *Defensio catholice fidei anglicane sectae errores* (1613) roused the ire of James I. by attacking the Eng. oath of allegiance. His collected works were pub. in 1856-61. See study by J. Lewesmeier, 1938.

**Subaltern**, see LIEUTENANT AND SECOND-LIEUTENANT.

**Sub-Carpathian Russia**, see RUTHENIA.

**Subconsciousness**, see PSYCHOLOGY.

**Subiaco**: 1. City of Italy in the prov. of Rome, 33 m. E. by N. of Rome, picturesquely situated in the Sabine Mts. The modern tn. appears to have grown up after the estab. of the anct. Benedictine

monasteries in the vicinity. Of these the most remarkable are the Santa Scolastica, which was built by the abbot Honoratus and in the eleventh century ranked as a principality, and the Sacra Speco, the buildings of which are clustered round the cave in which St. Benedict himself found asylum. Among other leading features of S. are Nero's villa and an eleventh-century castle, both in ruins. Paper and pottery are produced. The first book printed in Italy was the *Lactantius* of S. (1461). The tn. suffered heavy damage during the Ger. retreat of 1944, when a mass of fleeing vehicles was trapped in the main street and annihilated. The cupola and transept of the cathedral were very badly damaged and S. Pietro, a recently restored church, was virtually destroyed, but the above-named monasteries escaped essential damage. Pop. 9100. 2. N.W. suburb of Perth, W. Australia.

**Subinfederation**, see LAND LAWS.

**Subject and Subjective**. *Subject* means the mind as knowing something or as affected by a thing, while *object* is that which is known or which affects the mind in a certain way. Mind may be known in a direct, internal, or subjective way, by directing attention to what is going on in the mind at the time of its occurrence or afterwards. This is known as *introspection*, or the method of internal or *subjective* observation. On the other hand, mental phenomena may be studied as they present themselves externally in other minds. This constitutes the external, indirect, or *objective* method of observation. So, for example, a knowledge of others' thoughts may be arrived at by their speech or their motives by noticing their actions. Both methods possess difficulties. *Abstraction* is needed in the observation of one's own mental life, and to withdraw attention from the more striking events of the external world and to fix it on the more obscure events of the inner world is obviously difficult. On the other hand, there is a tendency, in reading the minds of others, to project one's own modes of thinking and feeling into them. Close attention must be given to the differences and similarities of external manifestation, and an effort of *imagination* made by which, through our own remembered experiences, we feel our way into a new set of circumstances.

**Sublimation**. When a solid, on the application of heat, passes straight to the gaseous state without first becoming liquid, it is said to sublime. On cooling the solid state is reassumed. S. depends on the fact that the boiling-point of the solid substance is lower than its melting-point at the pressure of the atmosphere. Thus by increase of pressure a substance which sublimates can be made to go through a liquid stage before passing into the gaseous state. By S. non-volatile impurities which are originally present are left behind, and thus a method of purifying substances which sublime is estab. Arsenious acid, benzoic acid, corrosive sublimate, and sulphur are purified by this means. When calomel (mercurous chloride) is sublimed, dissociation takes

place, a certain amount of recombination occurring on cooling. With ammonium chloride the substance is dissociated into ammonia and hydrochloric acid, which recombine on cooling (see DISSOCIATION). For the use of the term S. in psychology, see under FREUD, SIGMUND.

**Sublingual Glands**, smallest of the salivary glands, situated one on each side of the floor of the mouth, beneath the tongue. They have numerous ducts, which open along the sublingual fold in the mucous membrane of the floor of the mouth.

**Submachine Gun**. Its Ger. name, *Maschinenpistole*, shows at once its origin and function, i.e. a weapon intended to be to the pistol what the machine gun is to the rifle. Developed probably from the Mauser Parabellum, an automatic pistol of heavy calibre with detachable stock and a magazine containing some two dozen rounds, the first S. G. to be extensively manufactured was the Thompson (whence 'Tommy gun') under U.S. patent. Ostensibly sold for 'sporting' purposes, its chief users up to 1939 were Amer. bandits and policemen. A similar weapon, the 'Suomi pistol,' was used by the Finns in the 'winter war' of 1940-41, and at the same period the Ger. patrols on the W. front were armed with Schneisser S. Gs. These were all-metal weapons with folding stock and straight vertical magazine. The Suomi pistol inspired the prototype of the Russian S. G., which, like it and the Thompson gun, can be fitted with a vertical drum holding about 100 rounds, and fires bullets of heavy pistol calibre (about 45 m.m.). Other makes used in the Second World War were the Steyr-Solothurn and the Beretta.

A simple type of S. G., the Sten, was evolved in Great Britain. Its parts were mainly of stamped steel, and especially suited for mass production. It had a simple 'blow-back' open-bolt action, was subject to few stoppages, and was of a calibre which permitted it to fire standard Ger 9 mm. pistol ammunition. Thousands of these weapons were dropped to partisans in occupied Europe. It was also used by Brit. airborne troops, commandos, and the Home Guard.

S. Gs. are 'personal,' not support infantry weapons. None is effective over 200 yds. Their chief use is in patrolling and street fighting, and in the final stages of an assault. Russian cavalry adopted them instead of carbines. In the last stages of the Second World War the establishment of the Ger. *Folksgranadier* battalions provided a S. G. to every man in an infantry section, but few units appear to have been completely equipped on this scale.

**Submarine Cables**, see CABLE.

**Submarine Forests**, see under SUBSISTENCE.

**Submarine Mines**, see MINES, MILITARY AND NAVAL.

**Submarines** are vessels designed to operate both on the surface of the sea and submerged. Up to the present they have remained exclusively a naval craft, being used as a weapon of war, though in 1931 a submarine, *Nautilus*, was tried by Sir Hubert Wilkins for work under the ice

in the Arctic. During both world wars they played a most important part, particularly in the hands of the Gers., who made use of them to destroy merchant shipping with disastrous results to the Allies.

S. are submerged by flooding special ballast tanks, and in order to rise again to the surface the water in these tanks is discharged overboard, through valves placed at the bottom of the tanks, by means of compressed air. In addition, certain of the main ballast tanks have connections to electric pumps, which are sufficiently powerful to deliver against the greatest pressure of water ever likely to be met with in practice, and these may be used to empty the tanks in the event of the compressed air failing or other emergency. The time taken by a submarine to submerge in order to avoid being sunk by enemy action is of paramount importance, one or two minutes only being required by a modern vessel.

Earliest types of S. were circular in cross-section and the hulls consisted of a single shell, stoutly constructed to withstand the crushing effect of the water when submerged. Nowadays the double hull is adopted, particularly in the largest types. In this form the inner hull is the pressure hull and the outer is merely a light shell which is shaped to produce greater seaworthiness and to offer less resistance to surface propulsion, thus permitting higher surface speeds to be obtained. The space between the two hulls is used as ballast tanks. Sometimes certain of the ballast tanks are used for the storage of oil fuel in order to increase the range of action of the submarine. The conning-tower is built up from the pressure hull and is fitted with water-tight hatches at the bottom where it connects with the hull and at the top on a level with the bridge. As the conning-tower is the last portion of the vessel to be submerged it is generally stoutly constructed to resist gunfire. It also serves as a base to which the two or three periscopes are bracketed for support. Modern periscopes consist of a tube about 35 ft. long with glass prisms at the top and bottom; the top of the periscope normally projects about 3 ft. out of the water, whilst at the other end there is an eyepiece by which an observer in the vessel can see what is taking place on the surface. In modern S. Diesel engines driving twin screws generally provide the surface propulsion, and electric motors drive the propellers when submerged.

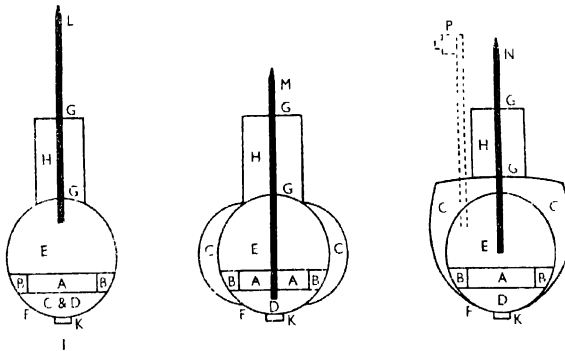
The first reliable practical attempt at building a submarine vessel appears to have been in the seventeenth century, when a Dutchman, Cornelius Drebbell, successfully navigated a boat, manned by twelve rowers, in the Thames. An interesting part of the invention was a fluid which would restore the 'vital parts' to vitiated air. An inventor, Dav, lost his life in a vessel intended to remain under water for twelve hours, in 1774, in Plymouth Sound. To Bushnell, an Amer., belongs the honour of undoubted success; his boat was fitted with two 'oars on the principle



of the screw,' a rudder at the stern, a valve to admit water for sinking the vessel, force pumps for driving it out again, and a device for attaching explosives to the bottoms of vessels. His ship was tried in 1775. In 1800 Robert Fulton, of steamship fame, made tests with an egg-shaped boat in the Seine and off Brest, remaining four hours under water, to a depth of 25 ft. He attached a torpedo to the bottom of an old hulk and blew it up. Compressed air was used in this vessel. In 1859 Delaney, another Amer., devised a similar vessel, and an Amer. shoemaker, Phillips, is said to have spent a day at the bottom of Lake Michigan with his wife and family in 1851.

In conjunction with Nordenföldt, the Swedish gun-maker, he built two others, which were sold to the Gks. and Turks respectively. A large one sold to Russia was built at Barrow-in-Furness, came round to the Solent, but was wrecked on the journey to St. Petersburg. These were all fitted with vertical screws. J. F. Waddington of Liverpool constructed a boat with horizontal rudders, driven by motors regulated by a pendulum for keeping the boat level.

A Fr. engineer, Goubet, in 1885 built a successful submarine boat, and four others were in use in 1897 in the Fr. Navy electrically propelled and fitted with compressed air reservoirs. In 1888 the



SECTIONAL DIAGRAMS OF THREE TYPES OF SUBMARINE: 1, SINGLE HULL;

2, SADDLE TANK; 3, DOUBLE HULL.

A, electric batteries, B, compressed air bottles, C, main ballast tanks, P, auxiliary ballast tanks, fuel and stores, E, living and machinery spaces, F, pressure hull, G, hatches, H, conning tower, K, keel, L, periscope, wireless and radar masts raised; M, periscope, wireless and radar masts housed; N, periscope, wireless and radar masts in raised position.

A Ger., Bauer, experimented in 1830 with a boat which was lost, but recovered later; he also carried out experiments for the Russians during the Crimean War. About the same time Scott-Russell, the builder of the *Great Eastern*, built a boat manned by twelve rowers in diving suits. In 1863 both Federals and Confederates tried submarine boats, the latter building the *David*, screw-propelled and steam-driven, but fighting 'awash.' It was armed with a spar torpedo and carried out an unsuccessful attack on an ironclad. Another *David* of a different type was built, and sank the *Housatonic*, though the spar torpedo was carried again in the 'awash' position; this boat was swamped in the manoeuvre and was lost with her crew.

In 1866 Flack, a Ger. inventor, lost his life in Valparaiso Bay, with seven companions, in the first trial submersion of his boat. The Rev. G. W. Garrett in 1876 performed successfully with a small model at Liverpool, and built a larger boat driven by steam under high pressure in a large boiler; this was lost off the Welsh

*Gymnote*, designed by Gustave Zédé after the idea of Dupuy de Lôme, was built; the outcome of the trials was the building of the *Gustave Zédé*, 1898, 160 ft. long, 270 tons, with electric motors developing 360 h.p., which was very successful in actual manoeuvres. This was followed by the *Moose* and the *Parfard* type, improvements on the *Gustave Zédé* and the *Narval*. The last named was oil-driven on the surface, with electric motors for submarine work. Another type, the *Peral*, named after its inventor, and launched at Cadiz, was very successful. Up to the end of the nineteenth century Great Britain did not take any active part in the development of the submarine, being content to leave the work in the hands of foreign nations and private individuals, and regarding this type of vessel as having no real future against such a strong fleet as hers. However, with the introduction of electricity for under-water propulsion great strides were made by the Fr. and Nordenföldt, but the most practical design was that of an Amer., J. P. Holland. Following The Hague

Conference of 1899, the Brit. Admiralty ordered five Holland type S. These were 63 ft. long, 11 ft. 9 in. beam, of circular cross-section, and shaped somewhat like a fat cigar. When submerged their displacement was 120 tons, and they were propelled on the surface by an internal combustion engine of 160 h.p. which gave a speed of 10 knots; when under water an electric motor of 70 h.p. propelled the vessel at 7 knots. The latter was driven from electric batteries, which could be recharged when on the surface by the petrol engine. The armament consisted of one torpedo-tube and five torpedoes, and as each was fired water was admitted to special tanks to counteract the loss of weight, thus maintaining the relative buoyancy. The method of submerging was by first admitting water into the tanks and then diving by the aid of hydroplanes or horizontal rudders, great care being taken to avoid diving too deep owing to the danger of crushing the hull by the great pressure of the water. The supply of fresh air was maintained from tanks of compressed air, whilst special apparatus was installed to purify air which had become vitiated. The crew numbered seven. These first S. were known as the 'A' class, and were shortly followed by larger, much improved vessels of 'B' and 'C' classes. Progress continued. The 'D' class were of 604 tons and, propelled by Diesel engines, had a speed of 14 knots. The hull design was radically altered, the main ballast tanks being external to the pressure hull, thus giving more room for machinery and living space inside the pressure hull. Modern S. are all built on this principle. The 'E' class of 850 tons and 1600 h.p., armed with five 18-in. torpedo tubes, followed in 1911-13, a 3-in. gun being added during the First World War. These S. were the main-spring of the Brit. war-time submarine fleet.

Fr. and It. designs became available in 1911 from which sprang the 'F', 'W', 'V', and 'S' classes. They were built just before the First World War and were not successful; they have no war record. The 'G' class with the saddle tank design of the 'E' class, but of the double hull type and armed with five torpedo tubes—two bow, two beam, and one stern—followed in 1915. Other war types were the 'J' class of 1820 tons, surface speed 19 knots with three Diesel-driven propellers, followed by the 'K' class of 2400 tons, steam-driven on the surface at 24 knots, armed with two 4-in. guns and eight 18-in. torpedo tubes. Strength of hull was sacrificed to speed in this type in an effort to build a submarine capable of keeping up with the fleet. But this requirement was of doubtful tactical value and the loss of submarine qualities outweighed the surface advantages. At the other end of the scale were the 500-ton 'R' class of low surface speed (8 knots) but with enormous battery power, giving them a designed speed submerged of 15 knots. This class was designed for submarine versus submarine work. Later in the war was produced the 'L' class, a

greatly improved 'E' of 1000 tons, 17 knots, Diesel-driven, 9 knots submerged speed, with six torpedo tubes (21-in. in the later numbers) and one 4-in. gun. Some of the 'E' and 'L' class were fitted to carry mines externally. Three 'M' class were also built but had no war service. They were of 2000 tons displacement, with a surface speed of 15 knots from 2400 h.p. Diesel engines and carried a 12-in. gun firing a 850-lb. shell at a maximum range of 20,000 yds. The gun could only be loaded or fired on the surface, but the submarine could be dived with the gun loaded. It was thus possible to fire the first round within a few seconds of passing periscope depth on surfacing. M 2 later had the gun replaced by a small aeroplane catapulted from a pressure-tight hangar. M 3 was converted to carry 100 mines externally and was the prototype of the 'Seal' class submarine minelayer used in the Second World War. The 'H' class, also built during the First World War in Canada, was a single hull type of 500 tons and was prefabricated in sections. Ger. U-boat development in the First World War consisted of enlarging a standard type, radical alterations being abandoned in favour of rapid construction. In the Brit. Navy no new types were produced after the First World War until 1925 when the giant X 1 of 3600 tons and carrying four 5.5-in. guns in two watertight turrets, in addition to torpedo tubes, joined the fleet. This was a failure and no attempt was made to follow up the type, although the Fr. *Sourcef* was even larger, carrying 8-in. guns and a small aircraft. The *Oberon*, a submarine of conventional type, displacing 1380 tons on the surface and 1800 submerged, was the next Brit. naval contribution and formed the prototype of the following 'O', 'P', and 'I' classes. From this time, except for a short period in the Second World War, all Brit. S. have carried names instead of numbers.

The London and Washington Conferences (q.v.), together with the urge for economy in naval construction, limited the Brit. submarine fleet, but a further type of fast patrol submarine, the 'River' class of three boats, was built in 1932. Of 1850 tons surface displacement these S. had a speed of 22 knots from twin Diesels of 10,000 h.p., six 21-in. torpedo tubes, and one 4-in. gun besides a big radius of action. After the It. crisis of 1935 the Brit. reverted to smaller boats with the 'S' class of 770 tons and 14 knots surface speed, 10 knots submerged, with six torpedo tubes, and the 'U' class of 630 tons and 11 knots speed with four torpedo tubes. The last class to be laid down before the Second World War was the 'T' class of 1320 tons, 15 knots, 10 torpedo tubes, and one 4-in. gun. These three types with the earlier 'O', 'P', and 'R' classes, the 'Seal' class minelayer, and the 'River' class formed the submarine fleet which rendered such magnificent service during the Second World War. Ger. U-boat building policy, until allied anti-submarine methods forced them to experiment, was similar in both world wars,

*i.e.* the development and enlargement of a proved type. In 1944 the Gers. introduced the Schnorkel, a breathing tube which did away with the boat having to surface to charge batteries, and also designed three new types: one large, one small with increased submerged speed, and one type which never reached production. This last was the true submarine which never requires to come to the surface and therefore demands only one method of propulsion. The designed speed of this new type was said to be well in excess of 20 knots submerged and will doubtless, at some future date, form the prototype of all submarine vessels. U.S. S. developed on standard lines from the Holland type of 1900 and during the First World War were mainly of the medium-sized patrol type. Nothing newish has been brought into actual service although many experiments have been made. The construction of a large 1500-ton type patrol class, with a surface speed of 21 knots from twin shafts each having two or four engines geared to the shaft, was started in 1940 and formed the main part of the U.S. submarine fleet in the Second World War. These 'Fish' class S. are of a very fine type with powerful armament, big radius of action, and the best living accommodation of any S. in the world. Air conditioning and air purification have been brought to a high state of efficiency. During the Second World War U.S. S. played a leading role in the Pacific war and also took part in certain operations on the African and European seaboard. S. of the Russian fleet have been built up from many sources, including Brit., and, as far as is known, form a heterogeneous collection of medium-sized patrol boats and small coastal types. Nothing is known of their post-war construction, but it is highly probable that Ger. technique has been largely used. During the Second World War Russian submarine patrols were mainly in inland waters of the Black Sea and Baltic with a few operating off the N.E. coast of Norway.

Up to the present there has been no attempt to reach any agreement on the limitation of naval armaments as was laid down at the London and Washington Conferences between the two world wars. The use of S. for unrestricted warfare against all types of shipping which was so condemned during and after the First World War led to attempts to return to the agenda of The Hague Conference of 1899 when the Russian Gov. proposed the total prohibition of S. as weapons of war, but found no response in the uneasy peace following the Second World War. Total war at sea, whether by the declaration of 'sink at sight' zones, or the acceptance that any enemy merchant ship sighted is taking part in that country's war effort and is therefore a fighting unit, has no more been questioned than the use of bombers over enemy towns and cities. Submarine development of the future seems, therefore, to be dictated by the amount of money each country is prepared to spend on it rather than by con-

siderations of any illegality of this form of warfare.

See H. C. Fyfe, *Submarine Warfare*, 1902; M. F. Suetter, *The Evolution of the Submarine Boat, Mine, and Torpedo*, 1907; T. W. Corbier, *The Romance of Submarine Engineering*, 1913; Sir H. Newbolt, *Submarine and Anti-Submarine*, 1918; W. G. Carr, *By Guess and by God, The Story of the British Submarine in the War*, 1936; K. Edwards, *We Dive at Dawn*, 1939; D. Masters, *Up Periscope*, 1942; and *Brassley's Naval and Shipping Annual*.

**Submaxillary Glands**, pair of salivary glands situated far back beneath the lower jaw on each side. Each gland is about the size of a walnut, and discharges its secretion by the submaxillary or Wharton's duct opening on the sublingual papilla on the floor of the mouth.

**Subotica** (Hungarian Szabadka), tn. of Vojvodina prov., Yugoslavia, near the Hungarian frontier 120 m. N.W. of Belgrade. It is a railway junction, and is the centre of a grain-producing area. Footwear, leather, and linens are made. Pop. 112,600.

**Subpoena**, name of the writ for calling a witness to bear evidence (*subpoena ad testificandum*). It is applied for only where it is feared the supposed witness will not voluntarily come forward or is actively hostile to the party calling him. The writ for calling upon any person to bring to court books, deeds, or other documentary evidence is called a *subpoena duces tecum*.

**Subrogation**, principle of S. in insurance is a deduction from the well-established rule that a contract of insurance of property is no more than a contract of indemnity. The principle as stated in the leading case of *Castellain v. Preston* is that, as between the insurer and the insured, the former is entitled to the advantage of every right or remedy, legal or equitable, of the latter, by the exercise of which rights and remedies the loss insured against can be or has been diminished.

**Subsidence, or Depression of the Land**, one of the great secular movements of the earth's crust, caused probably by the contraction of the earth on cooling. Evidence of depression is afforded by submerged forests, tirds, coral is., and by the disappearance of human construction. Submerged forests occur at sev. places on the Eng. coasts and in Holland and N. France. Fjords of Norway and the firths of Scotland are evidence of submerged valleys. On the coast of Dalmatia Rom. roads and villas have been reputed to be visible below the sea, but there is no real satisfactory evidence of regional change of level there in historic times, and the information regarding submerged Rom. villas is unreliable. In S. Sweden streets are submerged, and on the coast of Greenland a space of more than 600 m. is perceptibly sinking.

**Subsidies**: 1. Taxes in aid, as the S. formerly granted to the kings of England. S. were taxes imposed not immediately on property, but upon persons in respect of their reputed estates, at the nominal rate

of 4s. in the £ on lands, and 2s. 8d. on goods or personality. These S. were first voted in the reign of Richard I. and later came to be a fixed sum of £70,000. In 1398 a subsidy on wool and leather was granted to Richard II. for life. These S. were discontinued after 1663, when a land tax was substituted. 2. A sum of money paid by one state to another under the terms of a treaty, to purchase the service of auxiliary troops, or to acquire the aid of a foreign state in a war against an enemy. Thus Great Britain has at various times paid large S. to nations that have been her allies in war, especially against the Fr. in the eighteenth century. 3. Gov. grants to industries, commercial undertakings, etc., such as those made to shipping and air lines, and grants made to encourage beet sugar growing in this country. The best-known S. in the United Kingdom are the food S. of the Second World War and after. Particulars of the cost of these and other gov. S. in the United Kingdom in the years 1946-48 are given below (condensed from Cmd. 7649).

	1946	1947	1948
	£,000,000		
Food <sup>1</sup>	262	338	428
Agriculture	10	12	19
Trading losses	18	15	11
Utility cloth rebates	8	16	7
Assistance to industry	7	8	8
Fuel	4	7	1
Civil aviation corpora-			
tions	5	11	10
Total	314	410	490
Housing	23	24	25

<sup>1</sup> Excluding cost of milk and welfare schemes

<sup>2</sup> Of Board of Trade and Ministry of Supply

<sup>3</sup> By Ministry of Supply

**Subsoil**, layer of soil which usually occurs under the true soil; it sometimes extends downwards to a great depth, but in a hilly or rocky dist. is frequently absent altogether. It is always lighter in colour than the true soil, and is lacking in organic material, though it often contains plant food which has been washed down. As a rule there is little or no advantage in incorporating any of the S. with the layer above, but if it is broken up by deep digging or by the S. plough, deep-rooting plants are benefited.

**Substance**, in philosophy, that which exists in itself. This is the essential notion, and as such can be predicated of God. A created S. is that which exists in itself and arrives as a subject in which attributes (accidents) inhere. Such is the teaching of Aristotle and the scholastics, who classified S. according to their perfection as complete (e.g. God, angels) and incomplete (e.g. human and animal souls), and according to their degree of unity as single (God, angels, souls) and complex (man, animal, plant). This view was repudiated by Locke and others, who held that every object has some *fundamental* or *essential* quality, which, being present, preserves its identity, and which, being

removed, it is no longer the same S., but another. According to this system, therefore, S. is unknowable, or at least unknown, to which Kant attached the name *noumenon* (q.v.), while *phenomenon* (q.v.) indicates the exterior knowable quality of group of qualities which shows itself to our senses or is conceived directly by our intelligence. Scholastic philosophy, on the other hand, regards the Kantian doctrine as a contradiction in terms leading to scepticism or agnosticism. See BERKELEY; DESCARTES; HUME; KANT; LOCKE.

**Substitution**. In Rom. law no man could 'institute' or name an heir to his own heir who was past pupilarity (minority), so that substituted heirs or S. could take effect only as conditional institutions; i.e. the S. could succeed only in the event of the institute proving unwilling to take up his inheritance. In old Scots law clauses of S. in tailzie (entails) of heritable property gave the substitute a right as heir of provision at what time soever the institute died. S. in wills, marriage contracts and bonds, however, did not as a rule amount to more than conditional institutions.

In mathematics S. is the replacement of one algebraic quantity by another of equal value differently expressed, a device which is particularly useful in the integral calculus where solutions can often be obtained by the introduction of a new independent variable.

**Subways**, construction under the footways of streets used for telegraph wires, electric light, and power cables, gas, water, and other pipes. These S. are so constructed that there is room for a man to walk and work in, while at intervals inspection entrances are constructed, thus removing the necessity of breaking up the footways when it becomes necessary to repair the pipes underneath. S. are also a feature in the underground system of railways, connecting different tube railways together. Another feature is the construction of S. at the junction of important thoroughfares in cities to avoid the congestion of pedestrian traffic and lessen the danger to life. The Kingsway subway in London is used for electric trams. In the U.S.A. the term is applied to the underground electric railway systems of New York city. Except where they run under the rvs. and at one or two land points owing to the conformation of the terrain, the S. are in no sense 'tubes' like those of London. In the main they are tunnels built at a small distance beneath the surface of the streets. See also TUNNELLING.

**Successath**, see PATRICK, ST.

**Succession**. The law of S. is that according to which the S. to the property of deceased individuals is regulated. This may be (a) in cases where a deceased party has died intestate, when the order of S. is according to fixed rules for the most part based on the canon law (see DISTRIBUTION, STATUTES OF; INHERITANCE; and PRIMOGENITURE); (b) according to a settlement (q.v.) by deed, will, or other instrument, under which land or any interest in land or other property stands for the time

being limited (*see* LIMITATION) to or in trust for any persons by way of S.

**Succession, Apostolic.** *see* APOSTOLIC.

**Succession, Intestate.** The rules of I. S. as laid down in the Statute of Distributions, 1890, were considerably changed by the Administration of Estates Act, 1925. There is now no separate heir to land. Entirely new rules of succession are applied to a massed estate, irrespective of the character of the assets; these take the form of statutory trusts closely resembling the kind of trusts most usually adopted in modern wills and settlements (*see* SETTLEMENT; TRUSTS AND TRUSTEES). The new code of I. S. applies both to realty (*q.v.*) and personality. As regards realty, the ancient rule of primogeniture (*q.v.*) or inheritance by the eldest son, the right of dower or the widow's third, and of courtesy or the widow's life interest, gavelkind (*q.v.*), *hor. Eng.* (*q.v.*), and other special customs are all abolished. As regards succession to personality, parents are now on an equal footing, a mother is now restored to her former preference over an intestate child's brothers and sisters; relatives of the whole blood are preferred to those of the half-blood; and relatives more remote than first cousins are now excluded altogether from the distribution. Further the widow's first charge of £500 is increased to £1000, and the widower enjoys the same privilege; and finally, the widow or widower now, in addition, succeeds to all the 'personal chattels.'

The Act of 1925 provides that, after payment of funeral expenses, debts, death duties, and costs of administration, the personal representatives are to hold the entire residuary estate on trusts as follows: (1) The widower or widow receives £1000 free of death duties and also the 'personal chattels,' *i.e.* furniture, plate, books, stores, excluding, however, chattels acquired for business purposes. (2) If the intestate leaves no issue who live to take a vested interest, the personal representatives hold the balance of the residue on trust for the relief for life. (3) If the intestate leaves issue who live to take a vested interest, then, as to one-half of the residuary estate, it is held in trust for the relief for life, and as to the other half, in trust for the issue in their appropriate 'statutory trusts.' If any child has predeceased the intestate its share goes to his or her issue who are alive at the death of the intestate and who reach the age of twenty-one or marry. If any child dies under twenty-one years of age, and unmarried, his share goes automatically to increase the shares of his brothers and sisters. Power is also given by the Act to make advancements out of a share that has not yet vested. (4) If the intestate leaves issue, but no widow (or widower), the whole residuary estate goes to the issue, regard being had to the 'statutory trusts,' or, in other words, a child must have attained majority or have married or marry under the age of twenty-one. (5) If the intestate leaves no issue, the residuary estate, subject to the rights of the relief above mentioned (if any), goes automatically to the intestate's father or

mother or equally to both, if living. (6) If the intestate leaves no issue or parent, then, subject to the right of the relief (if any), the residuary estate is held upon trust for the following persons: (a) brothers and sisters; (b) half-brothers and half-sisters; (c) grandparents in equal shares; (d) uncles and aunts; (e) half-uncles and half-aunts; and (f) the intestate's widow (or widower) absolutely. The life interest of a husband or wife may be redeemed by payment to him or her of a capital sum so as to permit immediate distribution of the whole estate. Nephews, nieces, and cousins take *per stirpes*, as opposed to taking *per capita*; *i.e.* they take by representation, or, in other words, they take amongst them the share their deceased parent would have taken had he or she survived the intestate. For the former rules of intestate succession, which are still important in tracing title to land, *etc.*, *see* DISTRIBUTION, STATUTES OF.

**Succession, Royal.** Inheritance by heirs male when applied to the royal office, is the Salic Law (*q.v.*), which prevailed in France and other continental countries. Down to 1688 the Eng. S. was regulated by custom. Parliament claiming some right to intervene. In 1701, when it became evident that both William and his sister-in-law Anne would probably die without issue, the Act of Settlement was passed to provide for the S. after their deaths. This is the Act under which, as modified by the Act of Abdication of Edward VIII., the Crown is still held. It was confirmed, as to the Protestant S., by Acts passed in 1702, 1706, 1707, and 1709. The Act of Settlement (1) declares that if a Papist obtains the Crown the subjects of the realm are thereby absolved of their allegiance; (2) settled the Crown on the Electress Sophia and the Protestant heirs of her body; and (3) expressly excludes any person holding communion with the church of Rome, professing the popish religion, or marrying a Papist. The guiding purpose of the Act of Settlement was to exclude the exiled James II., his descendants, and all other Papists from the S., and in order to do so Parliament sought out the nearest Protestant to the old royal line, and they found her, rather remotely, in Sophia, the youngest and only Protestant of the twelve children of Elizabeth of Bohemia, herself the daughter of James I. No queen before the passage of this Act had succeeded with a wholly undisputed title; but under its terms it is placed beyond doubt that a king's daughter succeeds in preference to her father's, though not to her own, younger brother. It is by virtue of this rule that Queen Victoria ascended the throne instead of her uncle, Ernest, duke of Cumberland (though he inherited Hanover, which was under the Salic Law), and by the same rule that Princess Elizabeth, and not the duke of Gloucester, became heir-presumptive. Her child, Prince Charles Philip Arthur George (b. 1918), follows her and is himself followed by his future descendants of either sex and then by his sister, Princess Anne Elizabeth Alice Louise (b. Aug. 15, 1950), and the latter's

descendants, all these coming before Princess Margaret and her future descendants of either sex.

**Succinic Acid** ( $C_4H_4O_4$ ), dibasic acid occurring in amber, from which it is prepared by distillation in iron retorts. It can be obtained synthetically from its elements or from ethyl acetoacetate or ethyl malonate. It crystallises in colourless prisms (melting-point  $185^\circ C.$ ), readily sublimes, has an unpleasant acid taste, and is only sparingly soluble in cold water, alcohol, and ether.

**Succory**, see CHICORY.

**Succubi**, see DEMONOLOGY.

**Succulent Plants**, those which have developed fleshy parts owing to the storage of food in them. The cacti store food in thick stems, the leaves of which are reduced to scales or thorns, and in many other plants, e.g. the aloe and agave, the leaves are fleshy and packed with food.

**Suchet, Louis Gabriel, Duc d'Albúfera** (1772-1826), Fr. soldier, b. at Lyons, joined the revolutionary army, and served in Italy and elsewhere. As commander of the left wing of Masséna's army, he repelled the Austrian troops under Melas (1800), and so saved France from a S. invasion. Having assisted in securing the capitulation of Saragossa, he was made generalissimo of the army of Aragon (1809), and in two years pacified that prov. In 1810 he defeated the Sp. general, O'Donnell, and captured Lerida; two years later he crushed Blake's army and occupied Sagunto and Valencia. He went over to the Bourbons in 1814, re-joined Napoleon in 1815, and after a period of exile returned to France in 1819.

**Suehow, or Soochow**, tn. and treaty port of China, built on a group of is. E. of Lake Tai-hu, 56 m. W.N.W. of Shanghai, in the prov. of Kiangsu. There are silk looms, and the city is noted also for its cheap reprints of Chinese classics. Glass, metal, lacquer, and carved woods are also produced. A splendid city in the Middle Ages, S. has suffered from its demolition at the hands of the Taipings in 1860. Pop. 260,000.

**'Sucker State,'** see ILLINOIS.

**Sucking-fish**, term applied to all members of the acanthopterygian family Echeeneidae, the Remoras, in the div. Discoccephali, on account of the suctional oval disk they bear on the upper part of the head. By means of this disk they attach themselves to large floating objects, such as ships, or swift-swimming animals, as sharks, and they are to be found in all seas. Other S. are the suckers, which form the family Gobiocoleidae, and the lump-suckers, which form the Cyclopteridae.

**Suckling, Sir John** (1609-42). Eng. poet, playwright, and prose writer. b. at Whitton, Middlesex, son of a knight who held office as secretary of state and comptroller of the household to James I. S. studied at Cambridge, and then entered Gray's Inn. He inherited an ample fortune and large estates on the death of his father in 1627, and travelled abroad and is said to have served for a time under Gustavus Adolphus. On his return in 1630 he was knighted. He equipped a troop of men

for Charles's campaign against the Scots, which, however, fled at first sight of the Scots at Duns, an event which was lampooned in the ballad *Sir John Suckling's Campaign*. Later he became involved in a plot to rescue Strafford from the Tower, and had to flee to France, dying in Paris, probably by his own hand.

A wit, very generous, a noted gambler, and the inventor of the game of cribbage, he was highly popular. Though he wrote in more than one medium, it is as a poet that he still lives. Some of his shorter pieces are incomparable for charm and daintiness, such as *Constancy*, and the songs *I prithee send me back my heart* and *Why so pale and wan, fond lover?* S. clearly owes something to Donne, and wrote in the metaphysical fashion of the day. Generally speaking S. excels when dealing with concrete subjects or using imagery with which he is directly familiar. Light-hearted cynicism in the affairs of life is a characteristic of his pieces. His works were collected posthumously in *Fragmenta aurea* (1646). There are collected eds. of his works ed. by W. C. Hazlitt (1874, 1892), and by A. H. Thompson (1910). See life by A. Suckling, 1836, and K. M. Lynch, *The Social Mode of Restoration Comedy*, 1927.

**Sucre**: 1. State of Venezuela on the Caribbean coast and the gulf of Paria, with Monagas to the S. and Anzoategui to the W. There are petroleum and asphalt deposits. The cap. is Cumana. Pop. 291,000. 2. Or **Chuquisaca** (Indian for 'golden bridge'), tn. in the dept. of Chuquisaca, Bolivia, 8839 ft. above sea level and 48 m. N.E. of Potosi. Its halls of congress and president's palace recall that the city was once the headquarters of gov. S. is, however, the legal cap. and the actual seat of the judiciary, the univ., and the archbishop (La Paz being the actual seat of government). A bishopric since 1552, and the seat of the archbishop of La Plata and Charcas since 1609, it possesses a cathedral dating back to 1553. The univ. of St. Xavier was founded in 1624. The best buildings, besides the cathedral, are the government and legislative palaces, the palace of justice, consistorial building, and Juana College. A rail-car line runs to Potosi. In the vicinity are orchards and vineyards. Pop. 32,000 (including Indians and Cholos).

**Sucrose**, see SUGAR.

**Suction Cleaners**, see VACUUM CLEANERS.

**Suction Gas Plants**, see GAS MANUFACTURE, *Gas for Fuel or Power*.

**Sudan**, or **Soudan**, formerly the name of a vast tract of equatorial Africa lying south of the Sahara Desert and Egypt, and stretching from Cape Verde on the W. coast to Massowah on the E. It extended south to the Congo basin and the equatorial lakes, with Abyssinia and Brit. E. Africa forming its E. boundary. It was also known as Negritia, or Bilad-es-S., the 'Land of the Blacks.' Later it was divided into three geographical portions: Fr. S. on the W., central S., and the Anglo-Egyptian S. on the E. The S. included Senegal, the Fulah country, portions of Fr. Congo (now Fr. Equatorial Africa), the

Guinea Coast (now split up into various protectorates), part of the Congo Free State (now Belgian Congo), Sokoto, Bornu, Wadai, Kaem, Darfur, Kordofan, and many other minor states. The Fr. extended their possessions by exploration and military occupation from the W. coast eastwards beyond Lake Chad to the borders of the Anglo-Egyptian S., and southwards to the Ubangi and Congo Rts. As the various regions lying within the W. half and southern portions of the S. have, by a series of international conventions and treaties, been delimited (for further details concerning these protectorates and colonies, see the articles on SUDAN, FRENCH; SENEGAL; NIGERIA; etc.), therefore only the E. portion, the Anglo-Egyptian S., will be dealt with here.

This region lies south of Egypt and extends southwards to Uganda and the Belgian Congo, a distance of about 1400 m., and from the Chad Military Ter. in the W. to the Red Sea in the E., about 1200 m. It is bounded on the S.E. by Eritrea and Abyssinia. The estimated area of S. is 967,500 sq. m., and the pop. is estimated at 7,547,500, partly Arab, partly Negro, and partly Nubian. Native tribes include the Ababde, Baggara, Bisharin, Denka, and Nuer (see separate articles), and the Hadendoa. The latter were prominent in the Mahdist revolt of 1882 to 1898 (see MAHDI), the term 'fuzzy-wuzzy' being applied to them and to the Baggara. They are pastoral nomads living between the Abyssinian border and Suakin, in the Nubian Desert, and are included among the Beja (*q.v.*) peoples. Europeans number some 5600. The Nile traverses the region from north to south, with a large bend westwards about lat. 20° N., enclosing part of the Nubian Desert, which extends to the Red Sea coast. The Libyan Desert lies to the immediate W. Where the Nile enters the Anglo-Egyptian S., it is known as the Bahr-el-Jebel (or White Nile), receiving in its course the waters of the Bahr-el-Ghazal and Sobat Rts. At Khartoum it receives the Bahr-el-Azrek (or Blue Nile), an important affluent flowing N.W. from Abyssinia; henceforth it flows on as the Nile, taking in the Atbara above Berber. Between Wadi Halfa and Khartoum there are five of the six Nile cataracts. Along the shore of the Red Sea, running almost parallel to it, is an extensive range of mts., which attain their highest elevations in Jebel Erba (7480 ft.) and Jebel Sotuba (6889 ft.). Ports along a coast-line of nearly 400 m. include Port S. and Suakin; the trade of the former has greatly increased since the estab. of railways. S.W. of Khartoum is Kordofan, a plateau of some 2000 ft. elevation, while further W. is Darfur, with heights exceeding 6000 ft.

The most fertile regions are those lying east and south of Khartoum, watered by the Atbara and the Blue and White Niles. Here there are large areas under durra (the staple native food), millet, sesame, and pulse. The anct. wealth of the S. lay in gold, ivory, slaves, and ostrich feathers; to-day it is cotton which is grown principally in the deltas of

the Gash and Baraka Rs. The lack of a guaranteed grain supply, brought into existence the Gezira irrigation scheme, for the launching of which the Brit. Gov. guaranteed loans to over £11,500,000 sterling to cover the construction of the dam over the Blue Nile at Sennar and the main canalisation. A strict rotation of crops is observed, and the Gezira's anct. claim to be the granary of the S. is well substantiated by the durra (millet) sections. In 1940 the estimated grain crop from the irrigated area was 87,000 tons out of a total of 358,000, and in 1941 109,000 out of a total of 383,000. The scheme enables at present an area of 850,000 ac. to be cultivated between the Blue and White Niles, and one-quarter is under cotton. The S. is the chief source of the world's supply of gum arabic, the finest gum forests, apart from Kordofan, being in the Blue Nile dist. and Kassala. On the banks of the White Nile the soil is not so favourable, but in the forests near by the gum acacia, ebony tree, the rubber creeper, and the bamboo are found. The upper reaches of the Blue Nile flow through dense forests, which extend as far as Abyssinia; here valuable fibres and tanning materials abound. A large supply of papyrus is obtained from the sudd area in the upper reaches of the White Nile. Other products include senna leaves and pods, ground-nuts, chillies, dates, ghee (clarified butter), hides and skins, timber, trochus, and mother-of-pearl shell, bees-wax, and honey. Cattle and sheep are reared, S. supplying Egypt with much of her meat, and other livestock includes camels, goats, horses, and asses. There are salt-fields near Port S. which, though they already supply all internal needs, leaving some over for export to Abyssinia, are capable of great expansion. Cotton exports in 1947 were valued at £8,437,507, gum at £61,390,776, and cotton seed at £1,607,117. Total exports were valued at £E15,494,517. Total imports were valued at £E16,773,633, the prin. items being cotton piece-goods and metals and metal products. Trade is carried on chiefly with Britain, Egypt, and India. N. of Khartoum the country is mainly desert, save for narrow strips of cultivated land on the banks of the Nile.

The S. is divided into nine provs. or *mudiriyyas*, under governors or *mudirs*, and each prov. is further divided into dists. under commissioners with Sudanese administrative officials. Most dists. contain local administrations under the control of native local government authorities. Urb. local administration is now mostly in the hands of municipal or tn. councils, which contain a majority of Sudanese and a proportion of elected members. Civil justice is administered by the chief justice and judges of the high court, who are also members of the appeal court, and by subordinate dist. judges. The religious law of Islam is administered by the Muslim law courts in matters of inheritance, marriage, divorce, and family relations generally among the Muslims. There are dist. and prov. courts, and a high court (Makhama) at Khartoum

presided over by the Grand Kadi. There is a S. penal code. Serious crimes come before major courts, consisting of a president and two members. Decisions of major courts must be confirmed by the governor-general, to whom also there is a right of appeal. Lesser crimes are tried by minor courts of three magistrates and by magistrates' courts. In the N. sphere higher education is represented by the Gordon Memorial College, now in process of transition to univ. status. There are two secondary schools, with some 500 pupils. Two junior secondary schools were estab. in 1942 for vocational training. There are about a dozen intermediate schools which prepare boys for entry to the secondary school or for direct entry to minor gov. posts. There are 128 elementary schools for boys and 69 for girls. There are technical schools at Omdurman and Atbara, the latter solely for the needs of the S. railways. In the southern sphere the missions are the main agents of the gov. in education.

The chief tns. are Khartoum, the cap. (pop. 45,000); Omdurman, the Mahdi's cap. (pop. 116,000); Khartoum North (pop. 43,000); Wadi Halfa, Merowe, El Obeid, Port S., Suakin, Kassala, Nahud, Atbara, Wad Medani, and El Damer. The railway from Wadi Halfa to Khartoum was finally completed in 1905, and now Port S., Suakin, Merowe, Karcima (in Dongola), Senna, and El Obeid are also served; the total mileage open is 2013. Gov. passenger and cargo steamers ply the Nile, and regular services are estab. over 2300 m. From Kogat, on the upper White Nile, there is motor transport to the Belgian Congo and the Uganda frontier. There are thirty-five wireless stations and about 6400 m. of telegraph and telephone routes. S. Airways operate regular services from Khartoum to Juba, Asmara, El Geneina, and Port S., with intermediate stops.

The N. part of the Anglo-Egyptian S. contains many interesting antiquities, notably the rock-hewn temple at Abu Simbel, the pyramids and temples near Wadi Halfa, and the numerous pyramids at Meroe. Anciently the region, then known as Kush, later as Ethiopia, had great trade with Egypt, and from about 1500 to 1200 B.C. was part of the Egyptian domains. Kush was an independent kingdom, c. 750 B.C. to A.D. 350, the cap. changing from Napala to Meroe about 300 B.C. In the sixth century N. Sudan was converted to Christianity; a century later the Muslims arrived and eventually Christianity was replaced by Mohammedanism. Southern S. remained pagan, for until the nineteenth century it was entirely cut off by the sudd, or barriers of reeds and mud that blocked the Nile. Again under the rule of Egypt, which country was itself ruled by Turkey, the S. was misgoverned. Gen. Gordon was appointed governor-general (1877-79), and attempted its reorganisation. Then, in 1883, occurred the revolt of the Mahdi, resulting, in 1885, in the fall of Khartoum and Gordon's death. The Mahdi's successor, the Khalifa, held his own for nearly

thirteen years, desolating the country and reducing the pop. from 8,500,000 to under 2,000,000. In 1896 Lord Kitchener, having organised a new army, moved forward out of Egypt into Dongola, and in the following year advanced to Abu Hamad and began building the S. railway across the Nubian desert from Wadi Halfa to Abu Hamad. Then, in 1898, a joint Brit. and Egyptian Army marched against the Khalifa's cap., and shattered his power at the battles of Atbara and Omdurman. He himself was killed (Nov. 1st, 1899) at Gedid by a force led by Sir Reginald Wingate. Soon after this the latter succeeded Lord Kitchener as governor-general of the S., and thus began that beneficent period in which the country developed remarkable rapidity in agriculture, trade, communications, and medical services. In twenty-five years, from a state of utter desolation, the country's foreign trade reached more than £13,000,000 and its revenue £6,000,000.

On Jan. 19, 1899, Lord Cromer, the Brit. consul-general then in control of the rehabilitation of Egypt, and who had initiated and carried through the policy of conquest, concluded with the Egyptian Prime Minister, the agreement which since then has governed the status and administration of the S. This agreement gave to the S. a constitution in the form of a condominium between Britain and Egypt. It provided that the governor-general should be appointed by khedivial decree on the recommendation of the Brit. Gov., and should be removed only by such decree with the consent of the Brit. Gov. The governor-general was invested with full legislative powers, but since 1910 a council has been associated with him in the discharge of his executive and legislative powers. In 1943 an advisory council was instituted for the northern S. (the two southern provs. of Equatoria and Upper Nile being excluded), consisting of eighteen Sudanese members nominated by the councils of the six N. provs., three by each prov. council of two members (one Sudanese) chosen from the members nominated by the governor-general to represent social and economic interests. An ordinance was promulgated on June 19, 1948, setting up a legislative assembly and an executive council for the Anglo-Egyptian S., the ordinance being a practical move in the direction of self-government for the Sudanese people.

*Egypt's Claim to Sole Sovereignty of the Sudan.*—Proposals for the future of the Anglo-Egyptian S. were discussed by the Brit. and Egypt Govs. in 1946 during the treaty negotiations in the autumn of that year. It was tentatively agreed that the titular sovereignty should be vested in the Egyptian Crown, but that the joint administration should continue for some years and the Sudanese should eventually have the fullest freedom in choosing their own constitutional future.

See Sir H. A. MacMichael, *A History of the Arabs in the Sudan*, 1922, *The Anglo-Egyptian Sudan*, 1934, and *Address on the Sudan Problem to the Royal Empire*



*Society*, 1947; P. Crabitès, *The Winning of the Sudan*, 1934; J. A. de C. Hamilton (ed.), *The Anglo-Egyptian Sudan from Within*, 1937; R. L. Hill, *A Bibliography of the Anglo-Egyptian Sudan from the Earliest Times to 1937*, 1939; K. D. D. Henderson, *Survey of the Anglo-Egyptian Sudan, 1898-1944*, 1947; and J. D. Totlill, *Agriculture in the Sudan*, 1948. The works of many travellers may also be consulted, among them those of Baker, Burckhardt, Grant, Schweinfurth, Spoke, and Junker.

**Sudanese, Sudanic, or Sudanese-Guinean Languages**, see under NEGRO-AFRICAN LANGUAGES.

**Sudan, French**, colony of W. Africa, formed in 1904 from the ters. of Senegambia and the Niger, less the Senegal protectorate, which was returned to Senegal. Until 1920 it was known as the Upper Senegal Niger. In 1933 a part of the Upper Volta was added, and other minor changes were later made. It is bounded N. by the Algerian sphere; S. by the Ivory Coast, Fr. Guinea, and the Upper Volta; W. by the frontier of Fr. Guinea, the Falcémé R. separating it from Senegal, and Mauritania; and E. by the Niger colony. Its area is 582,500 sq. m., and includes two-thirds of the course of the Niger, the Upper Senegal valley, and a large part of the Sahara. The prin. tribes are Bambaras and Mandingo. It supports large herds of cattle, and ground-nuts, millet, maize, cotton, rice, sesame, gum arabic, and karité are produced. Pottery, brickmaking, jewellery, weaving, and leather-making are the native industries. The chief tns. are Bamako, the cap. (pop. 21,200), Kayes (10,000), Sikasso (10,000), Gao (9,400), Ségu (7,600), Ouahigouya (7,000), Timbuctoo (6,500), Goundami (6,000), Dire (6,000), and Djenné (5,300). Bamako and Kayes are joined by railway to the Senegal coast at Dakar. There are air services to Dakar, Brazzaville, and Algiers. Irrigation schemes have been carried out in the Ségou dist. on the Niger R. There are schools in all the prin. tns. There is a Mussulman superior school at Timbuctoo called a *médresa*, and in 1934 a similar institution was opened in Timbédra for sons of chiefs. The colony is under civil administration. The S. is represented in the Fr. National Assembly, the Council of the Republic, and the Assembly of the Fr. Union. Pop. 3,080,000. See M. R. Delavignette, *Afrique occidentale française*, 1931; J. Hall, *Timbuctoo*, 1934; and Y. Urvoy, *Histoire des populations du Soudan central*, 1936.

**Sudbury**: 1. Municipal bor. and mrkt. tn. of Suffolk, England, on the R. Stour, 16 m. S. of Bury St. Edmunds. The tn. consists of three parts in each of which is an interesting fifteenth-century church, and there is a fifteenth-century grammar school. The prin. manufs. are concerned with flour-milling, malting, and textiles, woollen manuf. being introduced by the Flemings in the fourteenth century. In the vicinity are Long Melford and Clare. Pop. 6700. 2. Part of the bor. of Wembley, 8 mi. from Euston, on the

Harrow road. S. has been included in the extensive urb. development of Wembley since 1900. 3. City of N.W. Ontario, Canada, cap. of a dist. of the same name, 300 m. N.W. of Toronto, on the Canadian Pacific and Canadian National Railways. In the dist. 90 per cent of the world's nickel supply is produced; lumbering is also important. S. became a tn. in 1893 and a city in 1930. It is a tourist centre for hunting, fishing, and camping. Pop. 42,000.

**Sudermann, Hermann** (1857-1928), Ger. playwright and novelist, b. at Matziken, E. Prussia, educated at Königsberg and Berlin. After editing a small political paper, he turned to literature and produced a steady succession of plays and novels, gaining a wide reputation. He later returned to prose and found material in the life and folklore of his Lithuanian home. A collected ed. of his stories and novels appeared in 1919 and of his plays in 1923. There are Eng. trans. of sev. works, including the important novels *The Mad Professor* (1928); *The Wife of Steffen Tromholt* (1929), and *The Dance of Youth* (1930), and the autobiographical *Book of My Youth* (1923). See lives and studies by M. Harden, 1903; K. Busse, 1927; S. Goldstein, 1929; and J. Leux, 1931.

**Sudeteland**, land formerly occupied by the Ger. minority in Bohemia, concentrated chiefly near the Ger. frontier formed by the Sudetic Mts. They were mainly descendants of the Ger. colonists invited by the Premyslid dynasty in the Middle Ages. Before the Second World War they numbered 4,000,000 or over 20 per cent of the pop. of Czechoslovakia, and controlled two-fifths of its industries. This Ger. minority was a useful lever in Hitler's hands to force the gateway into Czechoslovakia. Hence the Nazis alleged that this Ger. minority was always bitterly opposed to its inclusion by the treaty of Versailles in the new state of Czechoslovakia, and that it was ill-treated by the Czechs. Its deputies later pursued an obstructive policy in the Czech chamber, though the Ger. Clericals joined the gov. bloc. President Beneš, while acknowledging that the Sudeten Gers. had grievances, refused to entertain the idea of giving them national autonomy within the state. After the Ger. annexation of Austria, their leader, Henlein, urged on by Hitler, now increased his demands and called upon the Czech Gov. to transfer the Sudetic region to the Ger. Reich. This demand was, of course, rejected, but by the Munich Pact (9.9.) the orderly taking over of the Sudetenland by Germany was provided for. On the basis of the Potsdam Conference some 3,500,000 Gers. were evicted after the end of the Second World War.

**Sudetic Mountains**, mt. system of S.E. Germany, which extends from the Biezwia basin in Moravia to the Saxony and Bohemia borders. The prin. divs. are the Riesengebirge, Isergebirge, Glatzer, Adlergebirge, Eulengebirge, etc.

**Sudharam**, see NOAKHALL.

**Sudorifics**, see DIAPHORETICS.

**Sue, Joseph Marie** (1804-59), Fr. novelist, known as Eugène S., b. in Paris, studied medicine, and served in Spain and at Navarino as an army surgeon. In 1829, on his father's death, he inherited ample means and settled in Paris. The novels *Plick et Plock* and *Atar Gull* were pub. in 1831. In 1835-37 his conspicuous failure, *L'Histoire de la marine française*, was pub. His novels, realistic and ingeniously constructed, had great popular success, perhaps the best known being *Les Mystères de Paris* (1842), describing the underworld of the cap. *Le Juif errant* (1844-45) was an attack on the Jesuits. *Les Mystères du peuple* (1849-56) was suppressed in 1857. In 1848 S., who was an extreme Socialist, was elected a representative of the Assemblée Nationale, but on the election of Napoleon III. was expelled from Fr. ter., and retired to Annecy.

**Suessa Auruncorum**, see **SFESA**.

**Suessula**, see **MADDALONI**.

**Suetonius, Gaius Suetonius Tranquillus** (c. A.D. 75-160), Lat. historian, grammarian, and critic, b. in Rome, the son of a Rom. officer, became an advocate and later *magister epistolarum* to the Emperor Hadrian. His *Vite Duodecim Caesarum* has survived almost complete. A trans. is in Bohn's Classical Library. See F. C. Papes, *Suetonius, Lives of Twelve Caesars* (trans. H. M. Bird), 1931.

**Sueur, Eustache le**, see **LE SUEUR**. **EUSTACHE**.

**Suevi** (modern **Swabians**), Germanic people, said by Caesar to inhabit Baden, and by Tacitus a region to the N. and E. of this.

**Suez**: 1. Administrative div. of Egypt. Area 101 sq. m. Pop. 108,200. 2. Cap. of the above, a seaport tn. at the head of the gulf of Suez and W. of the S. mouth of the Suez Canal, 76 m. E. of Cairo. Port Ibrahim, 2 m. S. of Suez, is a fine harbour at the entrance to the canal. Pop. (1937) 49,700.

**Suez Canal**, waterway cut through the isthmus of Suez to connect the Mediterranean and the Red Sea. Such a canal seems to have been constructed in the time of Seti I. (1380 B.C.). The first serious steps towards making the modern canal were taken by Napoleon in 1798, but little progress was made till, in 1854, Ferdinand de Lesseps constituted the *Compagnie Universelle du Canal Maritime de Suez*, and drew up a scheme in concert with two Fr. engineers, Linant and Mougel. This was passed by the International Commission with a few alterations, and the work was begun in 1856. The canal was opened for working in Nov. 1869. The total expenditure of the company was £32,807,822 francs. This company was an Egyptian concern, authorised in 1856, with a capital of 200,000,000 francs in 400,000 shares of 500 francs each. Britain acquired from the khedive in 1875 a total of 176,602 shares for £4,000,000.

The canal was enlarged and improved in 1885-89, the depth finally being 9 metres, and the minimum width in straight parts from 65 to 75 metres, according to location, and on curves 80 metres. The canal

runs from Port Said along the edge of Lake Menzala, through the Bala Lakes, Lake Timsa, and the Great and Little Bitter Lakes to Port Ibrahim. The total length is 103 m., of which 21 m. are in lakes. It can be used by the largest vessels, and the average time of transit is about fifteen hours. A freshwater canal runs from the Nile to Lake Timsa, with branches parallel to the maritime canal. By a convention (Oct. 29, 1888) the canal was exempted from blockade, and vessels of all nations, whether armed or not, are to be allowed to pass through it in peace or war.

The effect of the First World War and the events of the years immediately after it upon the working of the canal was to increase Brit. influence in its control. The strategic importance to India of this waterway was recognised as much by France and Italy as by Britain. Under Article 8 of the Anglo-Egyptian Treaty of 1936 the defence of the S. C. zone is maintained by Brit. troops until such time as the contracting parties agree that the Egyptian Army can ensure, by its own resources, the liberty and entire security of navigation of the canal. Included in the general development of Egypt and the N.E. of Africa, following the First World War, was the building of Port Fuad, a new city opposite Port Said on the Asiatic side of the canal. The S. C. is a source of revenue to both the Fr. and Brit. Govs. The £4,000,000 which the Brit. invested in the purchase of the shares of the khedive of Egypt in 1875 has been repaid in dividends almost tenfold. On March 31, 1945, the Brit. holdings were valued at £32,035,239. The management of the canal is vested in a council of thirty-two administrators, of whom ten are Brit. A swing bridge, constructed after the outbreak of war in 1939, across the canal, estab. communication between Cairo and Beirut.

By the application of Egyptian company law Egypt has secured substantial gains in the control of the canal, particularly in the employment of Egyptian workers and in the appointment of additional representatives on the board. By the agreement of March 7, 1949, between Egypt and the company, the whole property reverts to the Egyptian Gov. at the end of the ninety-nine-year concession in 1968. In the meantime Egypt will take annually 7 per cent of the gross profits, with a minimum of £E350,000. Improvements have kept the canal up to date, and an improvement programme finished in 1933 allows the passage of ships up to 45,000 tons burden. The latest programme, set out in the above convention of March 1949, will cost nearly £5,000,000 and the work will take five years. The canal will be deepened another 20 in., permitting the passage of ships of 36-ft. draught.

The growth in traffic has been enormous. In 1880 2026 ships totalling 3,000,000 tons used the canal. In 1913 the figures rose to 5085 ships and 20,000,000 tons; in 1938 to 6171 ships and 34,000,000 tons; in 1948 to 8686 ships and 55,000,000 tons.

**Suez, Gulf of**, W. arm of the Red Sea after its bifurcation in lat. 28° N., whence it extends N.W. for 190 m. to lat. 30° N. It lies between Egypt and the Sinai Peninsula. Average breadth, 30 m.

**Suez, Isthmus of**, neck of land connecting Asia and Africa, having S. the gulf of Suez and N. the Mediterranean, and through which is cut the Suez Canal (*q.v.*). Minimum width, 72 m.

**Suffocation**, see ASPHYXIA.

**Suffolk, Charles Brandon, Duke of** (1481–1545), Eng. nobleman and soldier, son of Wm. Brandon, was brought up at the court of Henry VII., with whom he was a great favourite. He distinguished himself in the Fr. campaign in 1513, was created Viscount Lisle in that year, and duke of Suffolk a year later. In 1514 he married Mary, sister of Henry VIII. and widow of Louis XII. of France.

**Suffolk, William de la Pole, fourth Earl and first Duke of**, see POLE, WILLIAM DE LA.

**Suffolk**, most easterly, and one of the largest Eng. cos., is bounded by Norfolk, Cambridge, and Essex on the N.W. and south and by the North Sea on the E. The coast line, which is generally low and singularly regular, has been much encroached upon by the sea, a process which is still continuing. On the coast are the well-known watering places of Lowestoft, Southwold, Aldeburgh, and Felixstowe. The surface of the co. is flat on the E. and undulating on the S. and W. In the extreme N.W., near Mildenhall, is a small area of fenland, to the W. of which extend low chalk hills (352 ft.), outliers of the Chilterns. On the N.E. are the Broadlands (*q.v.*) as in Norfolk and around Brandon there is a large tract of heathland known as the Breckland, where many relics of prehistoric man have been found. The rivers are generally small, the most important being the Deben, Orwell, and Stour (forming the southern boundary of the co.), and lesser ones include the Waveney (separating S. from Norfolk), Bure, Alde or Ore, Lark, Linnet, and Little Ouse. Many of them are navigable in the lower reaches for barges, wherries, and small craft. Nearly all the co. is under cultivation, and the soil, though not rich, is extremely varied and fertile. Barley, oats, and wheat are grown on a large scale, and farming, especially since the Second World War, is in a very flourishing condition. Cattle, sheep, and pigs are reared, but the special local breed of horse, known as S. Punch (see under HORSE), once extensively used for agric. purposes, has to a great extent been displaced by the tractor and mechanical cultivation. The coast fisheries are amongst the most important in England, and Lowestoft handles the bulk of the herring and mackerel catch. Manufs. are chiefly concerned with agric. requirements, and farm implements are made at Ipswich, Stowmarket, and Bury St. Edmunds, and artificial manures (for which coprolites are dug) at the two former places. In addition, there are chemical works, and factories connected with linen, woollen, and horse-hair in-

dustries. Ipswich, the co. tn., and Lowestoft, are both ports, and other important tns. are Bury St. Edmunds (the shire tn. of west S.), Aldeburgh, Beccles, Eye, Southwold, and Sudbury, all of which are municipal bors.; lesser tns. are Bungay, Hadleigh, Halesworth, Haverhill, Saxmundham, Stowmarket, and Woodbridge. Communications are generally good and the co. is traversed by numerous roads, many of which, however, are apt to be somewhat winding. There is an excellent network of railways, though some of the smaller branch lines have been closed and bus services substituted. For administrative purposes the co. is divided into two divs. of E. and W. Suffolk, containing twenty-one Hundreds, and five parl. divs., which include the co. bor. of Ipswich. S. derives its name from having been settled by the South Folk in the latter part of the fifth century. The co. suffered much from the later incursions of the Danes. Walton was the scene of the landing of the earl of Leicester in 1173 when he marched against Henry II. During the fourteenth century S. became one of the richest cos. in England owing to the influx of Flem. weavers from abroad. During the Civil wars it was a stronghold of Parliament. Interesting remains of monastic buildings may be seen at Bury St. Edmunds (Benedictine), Leiston (Premonstratensian) Kersey, Butley and Ixworth (Augustinian), Sibton (Cistercian), and Clare (Austin Friary), and there are castles at Bungay, Clare, Eye, Framlingham, Haughley, Lidgate, and Orford, and fortified manor houses at Mettingham and Wingfield. Many of the numerous churches are of great size and beauty, and they are frequently ornamented with patterns in flint-work. Long Melford, Lavenham, Southwold, Hylthburgh, Woolpit, and Mildenhall being the best. Over forty churches have round towers, many of which date from the twelfth century. The domestic architecture is of great interest and Moyses' Hall, Bury St. Edmunds (twelfth century), and Little Wenham Hall (thirteenth century) are the earliest examples. Fine houses are at Hengrave, Helmingham, Long Melford, and elsewhere; Branches Park and Ickford House are little known mansions in remote country. Area 948,269 ac. Pop. (estimated 1949) 405,000. See A. Suckling, *History and Antiquities of Suffolk*, 1846; 1848; T. H. Bryant, *Suffolk*, 1912; D. Maxwell, *Unknown Suffolk*, 1926; H. R. James, *Suffolk and Norfolk*, 1930; H. R. Cantley, *Suffolk Churches and their Treasures*, 1938; A. Mee, *Suffolk* (King's England), 1947; W. Addison, *Suffolk*, 1950; and Victoria County History.

**Suffolk, tn.** of Virginia U.S.A., in Nansemond co., 75 m. S.E. by S. of Richmond. Pop. 12,000.

**Suffolk Breed**, see under SHEEP.

**Suffolk Punch Breed**, see under HORSE.

**Suffolk Regiment**, Brit. regiment, formerly 12th Foot, raised in 1685, fought under William III. in Ireland and Flanders, and under George II. at Dettingen. In 1719 it served as Marines in Sir George

Byng's fleet, and was present at the defeat of the Sp. fleet off Messina. In 1743 it took a notable part in the War of the Austrian Succession at Dettingen. It is one of the few select 'Minden' regiments, and also took part in the famous defence of Gibraltar (1779-83), going on to India to gain further honours at Seringapatam. The regiment served in the Kafir war of 1851-53, in the New Zealand war of 1860-1866, and in the second Afghan war of 1878-80. It was again in S. Africa for the war of 1899-1902. During the First World War it raised twenty-three battalions, which served in France, Flanders, Macedonia, Gallipoli, Egypt, and Palestine. In the Second World War the 1st Battalion fought in France in 1940, the 4th and 5th were at the defence of Singapore, the 7th was in N. Africa and Italy with the Royal Armoured Corps, and the 2nd served in Burma.

**Suffragan**, see BISHOP, *Suffragan Bishops*.

**Suffrage, Women's**, see WOMEN'S SUFFRAGE.

**Sūfism**, term based on the Lat. form 'Sufianus,' was introduced in 1821 by the Ger. F. A. Tholuck, to render the Arabic word *ṭasawwuf*, meaning 'spirituality' or 'spiritual theology,' including asceticism, mysticism, and emotional faith. A follower of *ṭasawwuf* is called *sūfī*. The latter word is derived from Arabic *sūf*, 'camel's hair,' and refers to the plain garment worn by the *sūfīs*, resembling the garments of some monks. S. started from practical asceticism (e.g. al-Ḥasan al-Baṣrī, d. 729), and as a revolt against Muslim ritual; it became a distinct religious movement in its final mystico-pantheistic form. S. interprets God, the one Being, as infinite moral good and eternal aesthetic beauty, the ecstatic love for whom shall relieve the soul of the pain of human desires. To attain to this ecstasy, S. demands implicit obedience to, and utter concentration of the mind emotionally and intellectually on, the Divine Being. Although often associated with Buddhism and with Christianity, it is probable that the strongest external influence which has affected S. is Neo-Platonism, which reached the Muslim world through the trans. into Arabic of works like the *Theology of Aristotle* (trans. during the caliphate of al-Mu'tasim, 833-842), but in the main it was a purely internal and national reaction, analogous in a way to Christian mysticism of the Middle Ages. There was a long struggle between S. and the other Muslim theological schools. S. has coloured almost the whole of Persian literature. See R. A. Nicholson, *The Mystics of Islam*, 1914, *Studies in Islamic Mysticism*, 1921, and *The Idea of Personality in Sūfism*, 1923.

**Sugar**, name of a class of sweet-tasting carbohydrates, which is subdivided into simple Ss. or monosaccharoses and the compound Ss. di- and trisaccharoses, etc. The mono compounds are termed pentose, hexose, heptose, according to the number of carbon atoms, 5, 6, or 7, in the molecule. They are hydroxy derivatives of paraffin hydrocarbons with an aldehyde or ketone group in the molecule (hence termed aldose

or ketose Ss.) from which their property of reducing Fehling's solution is due. Pentoses have the general formula  $C_5H_{10}O_5$  and hexoses  $C_6H_{12}O_6$ . Examples of the former are arabinose and xylose and of the latter dextrose (glucose or grape sugar) and levulose (fructose or fruit sugar.) The disaccharoses have the general formula  $C_{12}H_{22}O_{11}$  and include sucrose (cane S., the ordinary S. of commerce, whether derived from cane or beet); maltose (malt S.); and lactose (milk S.). Raffinose,  $C_{18}H_{32}O_{16}$ , is the best-known trisaccharose. Di- and trisaccharoses in water solution can be split into constituent monosaccharoses by heating with dilute acids or by action of enzymes. In this reaction one or two molecules of water are absorbed and the change is termed hydrolysis. Sucrose by hydrolysis yields glucose and fructose, the mixture being known as invert S. because the optical rotation of the solution is changed from the positive due to sucrose to the negative due to invert S. Invert S. with a little sucrose constitutes the major part of honey and, with rather more sucrose, golden syrup, the residuum being water and salts. In jam manuf. some inversion of sucrose is due to acidity of the fruit. Maltose on hydrolysis yields two molecules each of glucose and galactose. Sucrose, the most important S. and the most easily assimilable of all Ss., is very soluble in water, 3 parts to 1 at ordinary temp. and increasing with temp. rise, it is insoluble in absolute alcohol but will dissolve in aqueous alcohol. It crystallises from water in monoclinic prisms and melts at c. 188° C., giving a glassy mass on cooling (barley S.). Prolonged heating causes gradual dehydration, darkening, and production of caramel. Concentrated sulphuric acid or hydrochloric acid chars S. with the characteristic odour of burnt S.

Sucrose is commercially extracted from the stem of the S.-cane or from the root of the S.-beet. Smaller quantities are also obtained from S.-palm, S.-maple, and sorghum cane. The S.-cane contains 11 to 15 per cent S. and its juice 8 to 21 per cent. The latter is squeezed out in roller-crushing mills under great pressure, and the juice, after heating and clarifying by addition of lime cream to precipitate impurities (non-Ss.), is settled in tanks and the clear juice separated. Steam-heated quadruple effect evaporators concentrate it and it is then boiled in vacuum pans at low temp. to yield massecuite, a mixture of S. crystals and mother syrup. The latter is separated by spinning the massecuite in high-speed centrifugal machines. The mother syrup is reboiled, yielding a further crop of S., and its residual syrup reboiled a third time, yielding from the centrifugals a third crop of S. and cane molasses. The latter is economically exhausted of sucrose, although it still contains 35-45 per cent. The mixed Ss. constitute the brown raw cane S. which is sent to refineries for further purification by the carbonation process (lime and carbon dioxide gas) and bone charcoal process after which boiling yields the white

refined S., granulated, caster, icing, and cube. S.-beet roots contain on average about 17 per cent sucrose and the juice 12-15 per cent. The roots are washed, sliced, and extracted by hot water in diffusion batteries or continuous counter-current vessels and the juice purified by the carbonation process; after filtration follows a procedure identical with that in the cane S. industry. Raw beet S. also needs refining. The molasses from beet S. contains about 50 per cent sucrose. U.S.A. and continental practice is to treat it by the Steffan lime process or the barium process to recover more S., but this is not the custom in the United Kingdom. Both cane and beet factories may produce white S. by further purification of the clarified or the carbonated juice respectively, but the products are rarely of the high purity of refined S.

World production of S. in thousands of metric tons for 1948. Beet, Europe (including U.S.S.R.) 6517, of which the United Kingdom produced 484; U.S.A., 1644; Canada, 79. Cane, W. Indies, 7024; Central and S. America, 3419; Canada and U.S.A., including Atlantic and Pacific possessions, 2492; Asia, 2082; Africa, 1427; Oceania, 884.

See G. Purrie, *Sugar*, 1925; International Sugar Council, *Sugar Year Book*, 1918; N. Decerr, *History of Sugar* (vols. I and II), 1949 and 1950.

**Suggia, Guilhermina** (1888-1950), Portuguese cellist, b. in Oporto of It. descent, studied under her father and under Klingel at Leipzig. Following her début at Leipzig Gewandhaus concerts, she toured Europe. In 1906 she married Pablo Casals (q.v.), and gave up concert playing for six years. In 1912 she again toured. Later she settled in London, and gained Eng. nationality by her second marriage.

**Suicide.** A *felo de se* or S. is by Eng. law a person who, being of years of discretion and in his senses, takes his own life. The absence, real or supposed of this last condition is now very generally assumed by coroners' juries in order to save the reputation of the deceased, to ensure Christian rites of burial, and, doubtless, to express sympathy with deceased's dependants. It is also, by Eng. law, S. to kill oneself unintentionally in an endeavour to kill another maliciously. If two persons agree to commit S. together and one escapes and the other dies, the survivor is guilty of murder. The ann. figures of suicides in the United Kingdom showed a steady decline from 1938 to 1942; they then began to increase, showing an especially marked rise in 1946 as compared with 1945; the figure for 1947 was 4710, that for 1938 being 5794.

**Suidæ**, see **Pig**.

**Suidas**, Gk. lexicographer of about the tenth or eleventh century A.D. His lexicon is frequently quoted by Eustathius (twelfth to thirteenth century). It is an encyclopædic dictionary, with numerous literary quotations of considerable value, though uncritical and unequal. It was compiled from numerous writers, and it contains many passages from anc. writers whose works are lost.

**Suifu**, or **Suchowfu**, tn. of Szechwan, China, on Yangtze, 130 m. S.W. of Chungking. It is a trade centre, chiefly with Yunnan. Pop. 80,000.

**Sui Juris** (Lat. 'in his own right'), legal phrase borrowed from the Rom. law of emancipation, denoting a person who, not being an infant, lunatic, married woman restrained from anticipation, or otherwise under any legal disability (see **RESTRAINT UPON ANTICIPATION**) is legally capable of managing his own affairs, or of suing and being sued in his own right. In the law of trusts where there is only one beneficiary interested in the trust property, and such person is S. J., the trustee's *raison d'être* is gone and the beneficiary can call for a conveyance of the full legal estate.

**Suir**, riv. of Eire, rising in Tipperary, flowing S. past Thurles and Caher, and past Clonmel, Carrick, and Waterford, and uniting with the Barrow to form Waterford Harbour. Length 100 m.

**Suite**, form of instrumental music. The governing principle of the S. is the stringing together of a number of movements, originally dances, but now any pieces the composer desires, including chosen numbers from operas, ballets, etc.



Tate Gallery

SUGGIA, BY AUGUSTUS JOHN

**Suiyuan**, prov. of Inner Mongolia, N. China. It has eighteen cos and two administrative bureaux. The cap. is Kweisui. Farming is the chief occupation of the central area, which is linked by a series of canals with the Yellow R. Products include wheat, coal, and livestock. The inhab. live a nomadic agric. life. Area 134,146 sq. m. Pop. 2,167,000.

**Sujbulak**, see **SAJJBULAKH**.

**Sukkur**, or **Sakkar**, tn. and dist. of Sind, Pakistan, on the Indus. The tn. is the starting point of the railway traversing the Bolan and Nari passes to Quetta,

The Lloyd Barrage (*see under* LLOYD OF DOLOBRAN) lies near by. There are railway carriage works. Area of dist. 5550 sq.m. Pop. 6,926,600. Pop. of tn. 86,500.

**Sukwo**, *see under* MELANESIA.

**Sulaimaniya**, or **Suleimaniye**: 1. N.E. prov. (*liwa*) of Iraq, in Kurdistan, bordering on Persia. Pop. 222,700. 2. Cap. of the above, a centre for trade with Persia. Pop. 30,000.

**Suleiman**, *see* SOLYMAN.

**Suleimaniye**, *see* SULAIMANIYA.

**Sulimov**, cap. of the Cherkess Autonomous Region of the R.S.F.S.R., 60 m. S. of Voroshilovsk, in an agric. dist.

**Sulina**: 1. Centre of the three estuarine arms of the Danube, flowing through the Dobrudja. Length, 50 m.; width, 100 yds.; depth, 15 to 60 ft. 2. Port of Dobrudja dist., Rumana, at the mouth of the above, 120 m. N.E. of Constanta. Grain, wood, wine, and cattle are exported. Pop. 6000.

**Sulla**, name of a Rom. patrician family of the Cornelia gens.

**L. Sulla** (138-78 B.C.), surnamed *Felix*, the Dictator. He was questor in 107, when he served under Marius in Africa, and also with great distinction in the campaigns against the Cimbri and Teutones; but Marius becoming jealous of the rising fame of his officer, S. in 102 changed to a command under the colleague of Marius, Q. Catulus, who entrusted the chief management of the war to S. S. now returned to Rome. He was praetor in 93, and in the following year was sent as propraetor into Cilicia, with special orders to restore Ariobarzanes to his kingdom of Cappadocia, from which he had been expelled by Mithridates. S. met with complete success. The enmity between Marius and S. now increased, and S.'s increasing reputation had already led the aristocratic party to look to him as one of their leaders; but the breaking out of the social war subdued all private quarrels. Marius and S. both took an active part, but the achievements of S. threw those of Marius into the shade. S. gained some brilliant victories over the enemy, and took Bovianum, the chief tn. of the Samnites. He was elected consul for 88, and received from the Senate the command of the Mithridatic war. Marius, envious at not having received the command, obtained the expulsion of S., but S. returned to Rome at the head of his legions, which resulted in the proscription of Marius and his leading adherents. S. set out for Greece at the beginning of 87, in order to carry on the war against Mithridates. After driving the generals of Mithridates out of Greece, S. crossed the Hellespont, and early in 84 concluded a peace with the king of Pontus. S. now prepared to return to Italy, where, during his absence, the Marian party had obtained the ascendancy. He landed at Brundisium in the spring of 83. In the following year the struggle with the Marian party was brought to a close by the decisive victory gained by S. over the Samnites and Lucanians under Pontius Telesinus before the Colline gate of Rome. This victory

was followed by the surrender of Præneste and the death of the younger Marius. S. was now master of Rome and Italy, and one of his first acts was to draw up a list of his enemies who were to be put to death, called a *Proscriptio*. S. had been appointed dictator for as long a time as he judged to be necessary, during which period he endeavoured to restore the power of the aristocracy and Senate, and to diminish that of the people. In order to strengthen his power, S. estab. military colonies throughout Italy. S. likewise created at Rome a kind of bodyguard by giving the citizenship to a great number of slaves who had belonged to persons proscribed by him. After holding the dictatorship till the beginning of 79, S. resigned this office, to the surprise of all classes. He retired to his estate at Puteoli, and there died in the sixtieth year of his age. *See* T. Mommsen, *History of Rome* (vol. iv.) and C. Oman, *Seven Roman Statesmen*, 1902.

**Sullana**, tn. of Peru, S. America, in the dept. of Piura on the Chira It. and on the Payta-Piura railway. Pop. 12,000.

**Sullivan**, Sir Arthur Seymour (1842-1900), Eng. composer, *b.* in London. He entered the Chapel Royal choir in 1854, shortly afterwards studying at the Royal Academy under Stendale Bennett and Goss. His first important work was an overture, written during his student days at Leipzig (1858), where, with Franklin Taylor, Carl Rosa, and J. F. Barnett, he was a pupil at the Conservatoire; his masters included Plaidy, Moscheles, and Richter. As the associate of Sir W. S. Gilbert, he wrote many light operas for the Savoy, e.g. *H.M.S. Pinafore* (1878); *Pirates of Penzance* (1880); *Patience* (1881); *Iolanthe* (1882); *Mikado* (1885); *Iolanthe* of the *Guard* (1888); *Gondoliers* (1889). S. also composed choral works: *Light of the World* (1873), *Martyr of Antioch* (1880), *Kenilworth* (1884), and *Golden Legend* (1886); the grand opera *Tranholme* (1891); and other operettas such as *The Rose of Persia* (1900), anthems, hymn tunes, etc. *See* life, letters, and diary by H. Sullivan and N. Flower, 1935, and life by J. Thorpe, 1918.

**Sully**, Maximilien de Bethune, Duc de (1559-1641), Fr. statesman, *b.* at Rosny. In 1572 he was placed by his father, the baron de Rosny, in the service of Henry, the young king of Navarre. His father died about 1575 and left him entirely his own master. At first Rosny accepted an ensigny in the regiment of foot of which his relation Lavardin was colonel. He was persuaded in 1581 to accompany the duke of Anjou to the Netherlands, but he returned in 1583 to the king of Navarre, and was almost immediately dispatched to Paris to watch the intrigues there going forward. In that year he also married Anne de Courtney who died, however, in 1589. By his second wife, Rachel de Cochefflet, whom he married in 1592, he had nine children. Rosny's devotion to the cause of Henry was deep and unalterable; he was employed in many delicate and difficult negotiations, and at the battle of Coutras (1587), where he commanded

the small park of artillery, he contributed much to the victory. The services of Rosny, after the assassination of the Fr. king Henry III., and until the entry of Henry IV. into Paris (March 1594), were great. He was appointed a member of the great council of finance (1596). His first step was to obtain the appointment of a commission of inquiry into the state of the revenue and its collection. He was soon afterwards promoted superintendent of finance, and entered upon his duties with great zeal. S. decreased taxation and reformed the corrupt system of collection, and greatly improved the finances of the country. His success in this dept. led to his appointment as grand-master of the artillery, director of the marine, master of works, and director of bridges and highways. He became in fact sole minister of France. In 1606 he was created duc de Sully and a peer of France. The murder of Henry IV. in 1610 terminated the career of S. as minister, but he retained sev. offices, in which he continued to be active. He was appointed a marshal of France by Louis XIII. in 1634. In his later years he prepared his *Memoirs* of the great and royal economies of Henry IV. for pub. These were pub. between 1634 and 1662 (Eng. trans. 1756, 1856). See studies by E. Lavisse, 1880, and II. Carre, 1932.

**Sully-Prudhomme, René François Armand** (1839-1907), Fr. poet, b. and educated in Paris. His works, mostly of a philosophical nature, include *Stances et poèmes* (1865); *Les Épreuves* (1866); *Les Solitudes* (1869); *Les Destinées* (1872); *Les Vaines tendresses* (1875); *La Justice* (1878); *L'Expression dans les beaux arts* (1884); *Le Bonheur* (1888); *Réflexions sur l'art des vers* (1892); a metrical trans. of the *De rerum natura* of Lucretius; and *Étude sur Pascal*. He was elected to the Academy in 1881, and received the Nobel prize for literature in 1901. His best work is marked by a severe beauty of form and a serene melancholy of thought, and often shows great intellectual power. S.-P. believed that happiness could only be achieved by brotherly love, self-sacrifice, and pain. His *Journal intime* was pub. in 1922. See studies by Camille Hémon, 1907; R. Zyromsky, 1907; E. Estève, 1925; and P. Flottes, 1930.

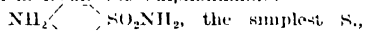
**Sulphate of Magnesia**, see EPSOMITE.

**Sulphite Wood Pulp** in paper manuf. is prepared from coniferous wood from which bark and knots have first been removed. The wood is then crushed and boiled in lined boilers of large capacity with bisulphite liquor. Digestion may take 20 hrs. under 75-lb. steam pressure or 80 hrs. under 45-lb. pressure. The earliest patent for the process was taken out in 1867 by Silghman, but was not commercially successful until Ekman's improvements in 1890. There are large sulphite pulp mills at Corner Brook, Newfoundland.

**Sulphonal**,  $(\text{CH}_3)_2\text{C}(\text{SO}_2\text{C}_2\text{H}_5)_2$ , is prepared by condensing acetone with ethyl mercaptan in the presence of hydrochloric acid, and oxidising the resulting mercaptole with permanganate. It forms colourless crystals (melting-point  $126^\circ\text{C}$ .) slightly

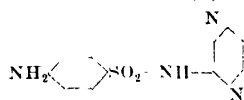
soluble in water, and is used largely as a hypnotic or soporific (dose 15-45 grains).

**Sulphonamides**. These drugs were discovered in 1935 by Domagk, working for the Ger. firm of Bayer (I. G. Farbenindustrie, Elberfeld); he showed that the aniline dye prontosil was effective in controlling an infection of mice by the lethal bacteria known as hemolytic streptococci. The numerous antiseptics already known to be capable of destroying bacteria were too toxic for use in the body, though Ehrlich had introduced salvarsan in 1909 as a means of combating spirochaetes, which are closely related to bacteria, and mepacrine (atebrin) was used in 1930 against the malarial parasite, a protozoal animal. In 1936 Colebrook at Queen Charlotte's Hospital used prontosil clinically for patients suffering from puerperal (childbed) fever, caused by hemolytic streptococci. In the same year also Fr. workers at the Pasteur Institute were able to show that the active part of the prontosil molecule was sulphanilamide:

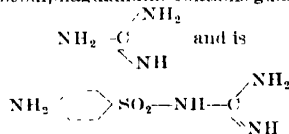


from which many others have since been prepared by replacing a hydrogen (H) atom in the  $\text{SO}_2\text{NH}_2$  group with another radicle. Sulphapyridine, for example, con-

tains the pyridine molecule  $\langle \bigcirc \rangle$  and is



whilst sulphaguanidine contains guanidine



The S. vary somewhat amongst themselves in their action, but they are in general effective not only against the hemolytic streptococci of puerperal fever, tonsillitis, erysipelas, etc., but also against the bacteria of pneumonia, gonorrhoea, and staphylococcal infections. S. have certain disadvantages; they may cause nausea and vomiting; owing to their low solubility they are liable to crystallise in the kidneys and impede the flow of urine unless ample fluids are taken; in susceptible persons they cause a rash. They may also cause agranulocytosis i.e. a shortage of granulocytic white corpuscles in the blood. The S. have been partly, but not entirely, supplanted by penicillin (q.v.) and other antibiotics. See II. Hawkins and J. Stewart Lawrence, *The Sulphonamides*, 1950.

**Sulphur**, symbol S, atomic number 16, atomic weight 32.06, a non-metallic element which occurs in the free state chiefly in volcanic dists., e.g. Italy and Sicily, Iceland, Japan, Texas, and Louisiana, U.S.A. In combination with other elements

S. is widely distributed, occurring in the sulphates gypsum ( $\text{CaSO}_4$ ), heavy spar ( $\text{BaSO}_4$ ), and Epsom salts ( $\text{MgSO}_4$ ), and also in the sulphides of zinc (blende), lead (galena), antimony (stibnite), and in pyrites. To free natural S. from earthy impurities it is stacked in brick kilns having a sloping floor and ignited with burning brushwood. Some S. burns and the heat of its combustion causes the remainder to melt and flow away from the impurities into rough moulds. About one-third of the total S. present is wasted by this method. Pyrites is sometimes burned in order to obtain S., but more generally the pyrites is roasted with excess of air to obtain S. dioxide for the sulphuric acid manuf. A great source of the supply of S. was the alkali-maker's waste (see ALKALI). The S. was obtained from this material by Chance's process, which consists in decomposing the moist waste with lime-kiln gases (carbon dioxide). Calcium carbonate and hydrogen sulphide are the ultimate products of the reaction, the latter of which is either burned with excess of air to S. dioxide and used in the sulphuric acid manuf., or burned with a limited supply of air and the S. obtained in the free state. The crude S. thus obtained is purified by distillation from iron retorts into brickwork chambers. In these chambers the S. condenses and forms a powdery deposit, the 'flowers of S.' of commerce. As the distillation goes on the temp. rises, the powder melting to an amber-coloured liquid which is run out into wooden moulds, forming the well-known 'roll S.' In the Frasch process, used in the U.S.A., superheated water is forced down into the S. (*in situ*, below ground). The S. melts and is forced to the surface, together with air, by means of special pumps. The process is very efficient, and most of the S. of commerce and industry is now obtained in this way. S. exists in the allotropic forms: octahedral ( $\alpha$ ), monoclinic ( $\beta$ ), and amorphous ( $\gamma$ ), also as nacreous (crystalline), plastic, and colloidal, whilst there are two forms of liquid S. ( $\lambda$  and  $\mu$ ). The vapour of S. is a mixture of  $\text{S}_8$ ,  $\text{S}_6$ ,  $\text{S}_4$ ,  $\text{S}_2$  in varying proportions according to temp. Native S. is octahedral, and is a pale yellow solid, soluble in carbon disulphide and in benzene, turpentine, etc. It is an extremely bad conductor of electricity and heat. At  $114.5^\circ\text{C}$ . S. melts to an amber-coloured mobile liquid. When the temp. is further raised, the liquid darkens in colour and becomes more viscid, until at  $230^\circ\text{C}$ . the liquid appears almost black and cannot be poured from the vessel. Further rise of temp. causes the liquid to regain its mobility, and at  $448^\circ\text{C}$ . it boils to a brownish vapour. Prismatic S. is obtained when melted S. is allowed to cool under ordinary conditions, or when crystallised from a hot solution in oil of turpentine. It forms monoclinic crystals which melt at  $120^\circ\text{C}$ . Monoclinic S. is not stable, but slowly passes to the rhombic form at ordinary temps. Plastic S. is formed when melted S. is poured into water. It is tough and elastic and insoluble in carbon disulphide, but is

unstable and in a few days passes to the rhombic state. The amorphous variety of S. is insoluble in carbon disulphide, and can be obtained by adding hydrochloric acid to a solution of sodium thiosulphate. 'Flowers of S.' is mostly the octahedral or rhombic variety, although some amorphous S. is present. 'Milk of S.' used in medicine is produced by the action of hydrochloric acid on calcium polysulphide. S. burns easily in air, forming S. dioxide. It combines directly with many metals and non-metals, forming sulphides, e.g. iron and copper burn brightly in S. vapour. S. is used as an insulator in pyrotechnics and in medicine as an aperient.

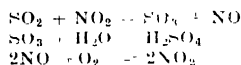
A few of the more important simple compounds of S. are the following: *Hydrogen sulphide* or sulphuretted hydrogen ( $\text{H}_2\text{S}$ ) is a gas which escapes from volcanoes, and is also found in some mineral waters which are reputed cures for rheumatism and some skin diseases. It is commonly prepared by the action of dilute hydrochloric acid on ferrous sulphide in a Kipp's apparatus ( $\text{FeS} + 2\text{HCl} = \text{H}_2\text{S} + \text{FeCl}_2$ ). Hydrogen sulphide is a colourless, poisonous gas, with a smell like that of rotten eggs. It is fairly soluble in water, its solution being slightly acid to litmus. It burns in air with a lilac flame, forming S. dioxide, water, and free S. Its value in the laboratory is as a reducing agent and on account of the fact that it precipitates the sulphides of certain metals from solution. The gas is absorbed by lime, with the formation of calcium hydrosulphide, and also by calcium sulphide (see Chance's process above). *Sulphur dioxide*, sulphurous anhydride ( $\text{SO}_2$ ), is a gas met with in the emanations from volcanoes, and is formed wherever S. or its compounds are burned in air. For the manuf. of sulphuric acid, S. dioxide is prepared by roasting pyrites in air  $4\text{FeS}_2 + 11\text{O}_2 = 2\text{Fe}_2\text{O}_3 + 8\text{SO}_2$ . The laboratory method of preparation consists in heating copper turnings or S., with sulphuric acid, or by the action of an acid on a sulphite, when the gas is evolved. S. dioxide is a colourless gas with a suffocating smell, and is very soluble in water (1 vol. of water at  $0^\circ\text{C}$ . dissolving 80 vols. of gas), forming an acid solution (see SULPHUROUS ACID). The gas is easily liquefied (at  $-10^\circ$  under ordinary pressure) and is thus supplied in that condition in syphons. The liquid is used as a refrigerator, low temps. being produced by its rapid evaporation. The solution of the gas in water is used as a reducing agent and for bleaching straw and wool. S. dioxide is used as a disinfectant and as an 'antichlor' to remove last traces of chlorine from articles bleached with the latter. *Sulphur trioxide*, sulphuric anhydride ( $\text{SO}_3$ ), is produced when a mixture of oxygen and S. dioxide is passed over heated platinised asbestos, or it may be conveniently prepared by gently distilling pyrosulphuric acid. It is a white crystalline solid (melting-point  $15^\circ\text{C}$ .) which fumes in contact with air and combines violently with water to form sulphuric acid.

*Sulphuric Acid, Hydrogen Sulphate*, or Oil of Vitriol ( $\text{H}_2\text{SO}_4$ ), is formed when



sulphur trioxide is dissolved in water. Commercially the acid is formed by two processes—the 'Chamber' and the 'Contact' processes.

**Chamber Process.**—This depends upon the formation of sulphur trioxide from the dioxide and the subsequent solution of the former in water. Sulphur dioxide does not become oxidised to the trioxide without the aid of a catalytic agent. When sulphur dioxide and oxygen are mixed with nitrogen peroxide in the presence of steam a series of reactions takes place resulting in the formation of S. A. The exact course of the reaction is still incompletely understood, but the following simple scheme is often adopted:



If a meagre supply of water is present, white crystals of nitrosylsulphuric acid,  $\text{SO}_3(\text{OH})\text{NO}_2$  (chamber crystals), appear, and it is probable that this compound represents an intermediate stage in the formation of S. A. by the chamber process. The sulphur dioxide is produced by burning sulphur or more generally by roasting pyrites in kilns with a regulated supply of air. Sometimes spent oxide (ferrie oxide which has been used to remove sulphuretted hydrogen from coal gas) is used as the source of sulphur for the production of sulphur dioxide. The supply of nitrogen peroxide requires to be replenished owing to loss, the gas being generated by the action of S. A. on nitre contained in earthenware pots and placed in the flue of the pyrites burners. Three to four parts of nitre are required for every 100 parts of sulphur burnt as pyrites. Recently the oxides of nitrogen have been obtained from ammonia by a catalytic process involving the use of platinum gauze. The S. A. plant consists of four main parts, viz.: Apparatus for (1) producing sulphur dioxide; (2) for the production of oxides of nitrogen; and (3) for the absorption of oxides of nitrogen from the gases leaving the chambers; and, (1) lastly, the chambers in which the reactions take place. The hot gases are first passed through a chamber to remove any suspended dust, and then into the Glover tower, which is packed with flints, stone, or quartz. Down this a stream of S. A. containing nitric oxide dissolved from the Gay-Lussac tower (*see below*) is allowed to spray, and the ascending gases expel nitric oxide from the descending acid, whilst the oxygen present converts the nitric oxide to nitrogen peroxide. Some chamber acid is also allowed to flow down the tower and is concentrated thereby. From the Glover tower the gases next pass to the bottom of the lead chambers, where sprays of water are introduced through the roof, when the reaction proceeds which results in the production of S. A. Nitric oxide is formed and is oxidised to nitrogen peroxide. The lead chambers are supported at a considerable height above ground on cast-iron columns. The material of the chamber is pitch pine lined with

lead sheeting (weighing about 6 lb. per sq. ft.). Each chamber is about 100–130 ft. long, 20–30 ft. wide, and 25 or even more feet high. Great care is essential in the construction and workmanship of these chambers. After the bases have reacted in the chambers they pass next to the Gay Lussac tower, which is packed with coke. Strong acid pumped from the Glover tower trickles down, and this dissolves any remaining oxides of nitrogen in the gases. The acid is then pumped back to the Glover tower. S. A. collects in the chambers and is withdrawn when it reaches a sp. gr. of 1.6, otherwise the leaden chambers are corroded. The acid if so required is further concentrated in leaden pans, or if a high degree of concentration is wanted, in glass or platinum vessels. Impurities, such as lead sulphate, arsenic, and oxides of nitrogen, are generally present in the acid. The arsenic is removed by precipitation as the sulphide and other impurities are got rid of by distilling the acid after addition of ammonium sulphate. In modern practice the lead chambers are often entirely dispensed with, and are replaced by one or two extra Glover towers, in which the formation of the acid takes place.

**Contact Process.** The principle involved in this method is that sulphur dioxide and oxygen unite to form sulphur trioxide in the presence of a suitable catalyst, at temps. which are not too high. A mixture of sulphur dioxide (from burning sulphur or from roasted pyrites) and air is cooled, thoroughly freed from dust and other impurities by passing through dust chambers, washed with a small amount of alkali, and then, after being heated to about 400–450 °C., subjected to the action of a catalyst. In the Badische process the catalyst is made of platinised asbestos, spread in layers in vertical steel cylinders. The gases pass up outside these tubes and are then deflected through them. Great care must be taken to ensure that the temp. does not rise too high. The resulting gases, which contain sulphur trioxide, are then treated, and the sulphur trioxide is absorbed in strong S. A. (97–98 per cent), water being added so as to keep pace with the absorption of the trioxide and to maintain the acid at about the same strength. Ferrie oxide and vanadium preparations are also employed instead of platinum as the catalytic agent. Other methods have been tried from time to time for the manu. of S. A., and amongst them may be mentioned the method which uses as the starting point calcium sulphate, a substance which occurs in the mineral form as gypsum and anhydrite.

S. A. is a colourless, oily liquid (sp. gr. 1.84) which has a great affinity for water. The strongest acid contains about 2 per cent water, and on cooling to 0 °C. this acid forms colourless crystals which melt at 10.5° C. On account of its powerful affinity for water, the acid is used as a desiccating agent. If the acid is poured on wood or sugar the elements of water are withdrawn and carbon left. The mixing of the acid with water is accompanied by a great evolution of heat, hence

care must be taken when mixing, otherwise explosive ebullition takes place. S. A. is used in the Lobblanc process for carbonate of soda, in galvanising, tinning, explosives, artificial silk, plastics, and aerated water industries and many others, and in the production of dyes, and many important organic 'intermediates.' The acid is dibasic, forming both normal and acid salts. Of the normal salts, *several* occur in nature, viz. barytes ( $\text{BaSO}_4$ ) and Epsom salts ( $\text{MgSO}_4$ ). The sulphates are mostly soluble in water, those of lead, calcium, and strontium are only sparingly soluble, while barium sulphate is insoluble in water and in acids. This last salt is, therefore, used as a test for the presence of the acid. Addition of a soluble barium salt to a sulphate is followed immediately by the precipitation of the insoluble barium sulphate. The acid salts are similar in properties to the normal salts, but have an acid reaction. The alums are a well-known group of double sulphates (*see* ALUM). Pyrosulphuric, Nordhausen, or fuming S. A. is obtained by dissolving sulphur trioxide in S. A., and was formerly prepared by the distillation of ferrous sulphate in clay retorts. It is a colourless, strongly fuming liquid (sp. gr. 1.88) and solidifies on cooling to a crystalline mass (melting-point  $35^\circ \text{C}$ ). It forms a stable series of salts known as the disulphates. *See also* OLEUM. *See* H. A. Auden, *Sulphuric Acid and its Manufacture*, 1930, and A. M. Fairlie, *Sulphuric Acid Manufacture*, 1936.

**Sulphuric Ether**, *see* ETHER.

**Sulphurous Acid** is known only in solution and is contained in a solution of sulphur dioxide in water ( $\text{SO}_2 + \text{H}_2\text{O} = \text{H}_2\text{SO}_3$ ). Several hydrates with six, ten, and fourteen molecules of water are known. The solution smells strongly of sulphur dioxide and gradually oxidises in air to sulphuric acid. It is dibasic and forms two series of salts: normal sulphites prepared by the action of excess of hydroxide or carbonate of the metal upon the acid, e.g. sodium sulphite ( $\text{Na}_2\text{SO}_3$ ); acid sulphites such as potassium hydrogen sulphite ( $\text{KHSO}_3$ ) prepared by having excess of acid acting on the hydroxide. The alkaline sulphites are soluble in water, the sulphites of other metals being insoluble or nearly so. The metabisulphites (e.g.  $\text{K}_2\text{S}_2\text{O}_5$ ) and the bisulphites are also derivatives of the acid and are used in photography. Chemically the sulphites and the acid are reducing agents.

**Sultan**, Muslim title of dignity borne by numerous E. and African rulers; e.g. those of Turkey (until 1922) and Morocco. The former was the 'Sultan of Sultans' or 'Padishah.'

**Sultanabad**, tn. in the prov. of Hamadan, Persia, 80 m. S.W. of Qum, on the Trans-Iranian Railway. There is trade in carpets. Pop. 35,000.

**Sultanpur**, dist. and tn. of the United Provs., India, 60 m. N.E. of Allahabad, on the Gumbi R. Area of dist. 1699 sq. m. Pop. 1,100,400. Pop. of tn. 10,500.

**Sulu (Sooloo, Yolo, or Jolo) Archipelago**, archipelago of the S. Philippines, having the Sulu Sea on the N.W., the sea of

Celebes on the S.E. There are about 190 is., divided into six groups. Products include coffee, rice, hemp, sesame, indigo, and cocoa; shell and pearl fishing, weaving, and cord-making are carried on. The cap. is Sulu (Jolo), on the N.W. coast of Sulu Is. Area 1560 sq. m. Pop. 120,000, mostly Moros. For the naval battle, Oct. 23-24, 1944, in the Sulu and Surigao Seas, *see* PACIFIC CAMPAIGNS IN SECOND WORLD WAR.

**Sumach, Sumac, and Shumack**, names given to *Rhus coriaria*, a species of Anacardiaceae found in S. Europe. Its leaves when ground are used in dyeing and tanning. The W. Indian S. is a species of *Brunellia*. The shrub, *colinus*, of this genus, with light purple flowers, is also known as the smoke plant. *Typhina*, a tree with greenish-yellow flowers, is the stag's horn S. The species is poisonous, especially *Rhus toxicodendron* (poison ivy) and *R. venenata* (poison elder).

**Sumatra**, large is. of the United States of Indonesia, lying W. of Borneo and S.W. of the Malay Peninsula, trending from N.W. to S.E., its W. shores being washed by the Indian Ocean and its E. shore by the Malacca Straits and the China Sea. Its surface is mountainous, especially near the W. coasts, where there are sev. volcanic peaks which rise to an altitude of nearly 10,000 ft. Towards the S. the mts. form a range running close to the sea coast, where the heights of the peaks are less imposing, but the volcanoes are more active, one of them, Kala, sending out a continuous stream of lava for three years at the end of the nineteenth century. Krakatoa (q.v.) lies on a little is. between Sumatra and Java. The country is watered by numerous rivers, the Asahan, Musi, and Jambli being the chief; these, and others on the E. side, are navigable. There are 431 m. of state railways, and air services from Palembang to Batavia, Singapore, and Medan. The prin. ports are Palembang, in the S.E., Padang in the W., Sabang in the N., and Belawan in the N.E. Numerous is. surround the coast, the largest being Banka Is. in the S.W. Parts of the is. are densely forested, vegetation is luxuriant, and the climate is tropical, lying in the zone of alternate monsoons, giving it a dry and hot season from May to Sept. and a rainy season from Nov. to March. The equator divides the is. into two almost equal parts. In the N. of Sumatra, near Achin, coal is mined, and petroleum extracted at Palembang. Snak, Deli, and Achin. Gold, copper, iron, sulphur, naphtha, alum, and saltpetre are also found in the neighbourhood of the volcanoes. Magnetite, lignite, and marble can be quarried, and there are tin mines. The vegetation is luxuriant, and on the W. coast are forests of teak, santal, and ebony trees, valuable for their wood, and the even more valuable gum-producing camphor and benzoin trees. Coco-nut and sago palms flourish, and in Achin areca-palms, capable of supplying Sumatra with areca-nuts. Tobacco grows well on the W. coast, and other products include pepper, nutmegs, spices, sago, millet,

cocoa, coffee, betel-nuts, and rice, which are all extensively grown. Wild animals abound, the birds are in great variety, and insect pests swarm. Many varieties of fish are found in the S. waters, and there are extensive shad fisheries, particularly on the E. coast. These fish are mainly exported from Palembang and Djambi. The cliffs of Achin yield the swallows' nests used by the Chinese for soup. The oldest native elements of the pop., the Kubu, Uhe, Lubu, etc., and the proto-Malayan races, the Batak, Gajo, Achinese, etc., were driven into the interior by Muslim Malays of the coast. There are Javanese on the plantations in the N. and S., and Arabs, Indians, and Chinese live in the tns. as traders. The most advanced of the native peoples are the Menangkabans, of the W. coast plateaus, their weaving, silver-work, and architecture being well known. Sumatra was a Hindu kingdom from the seventh to the thirteenth centuries. Then came the Arabs, who introduced the Muslim faith. The Portuguese estab. trading posts in 1509, but were expelled by the Dutch towards the close of the sixteenth century.

Palembang was raided by Jap. aircraft on Feb. 7, 1942; the Dutch destroyed the oil wells on Feb. 14, and the tn. was occupied by the Jap. forces on Feb. 21. From Jan. 24 to 29, 1945, Brit. aircraft from the carriers *Illustrious*, *Indomitable*, *Indefatigable*, and *Victorious* destroyed the oil refineries at Palembang, of major importance to the Jap. war effort in this zone. The is. was liberated in the autumn of 1945. See also *INDONESIA; INDONESIA (DUTCH)*. See E. M. Loeb, *Sumatra: its History and People*, 1935; E. S. de Klerck, *History of the Netherlands East Indies*, 1938; F. M. Schmitzer, *Forgotten Kingdoms in Sumatra*, 1939; and B. H. Vlekke, *The Story of the Dutch East Indies*, 1945.

**Sumba**, see SANDALWOOD ISLAND.

**Sumbawa**, is. of Indonesia, one of the Lesser Sunda Is., Malay Archipelago. Area 4300 sq. m. Pop. 180,000.

**Sumer**, or **Sumer**, term which the anc. Semites (i.e. the Accadians) of Mesopotamia applied to the country of the lower valley of the Tigris and Euphrates, i.e. S. Babylonia.

Little is known of the early hist. of S. or of the origins of the Sumerians. It is still uncertain whether they were the aboriginal inhab. of Mesopotamia or whether they came from outside. It seems, however, more probable that they were early immigrants, that they entered Mesopotamia in the first half of the fourth millennium B.C., and conquered the land from the Semites, who continued the struggle for over 1500 years, until with the help of new Semite invaders they gradually pushed the Sumerians into the southern portion of the valley, and finally (in the first centuries of the second millennium B.C.) defeated them completely. The Sumerians represented the dominant cultural group of the Near E. for the aforementioned 1500 years, in which period they invented the first known system of writing (gradually developed into the 'cuneiform writing,' q.v.), and

produced a vast and highly developed literature, consisting of myths, hist., hymns, liturgies, epics, commercial documents, etc. Even after the loss of political independence, the Sumerian cultural supremacy continued for many centuries. The Accadians adopted from



British Museum

SUMERIAN FIGURE OF THE GUDEA PERIOD, FOUND AT LAGASH IN 1923

It shows a Sumerian governor, either Gudea himself or his son, Ur Ningirsu.

them the script, the literary and liturgical language, and a large part of their literature.

**Sumerian Language** (in Accadian, *lišan šumēri*, or 'language of Sumer'). Its affinities are still a matter for discussion. Different philologists claim to have discovered in it resemblances to Basque, Georgian, Chinese, Turkish, Bantu, and other languages, but particularly to Ural-Altaic or Caucasian forms of speech. Its structure is complicated and not yet fully understood, though it can now be trans. with a considerable degree of accuracy. Sumerian was an agglutinative speech, i.e. it was composed of monosyllabic roots, whose meaning was extended or modified by prefixed and suffixed grammatical particles; e.g. *šaḡ* = 'heart,' *šaḡ-mu* = 'my heart,' *šaḡ-mi-la* = 'from my heart.' These particles could be attached to whole clauses or sentences as well as to individual words, e.g. 'From the terror of God' is *Nig-huš-dingir-a-la*, where *dingir* = 'God,' *nig-huš* = 'terror,' *-a* (for *-ak*) = 'of,' and the ablative particle *-la* governs the whole preceding phrase. The formation of the verb was extremely complicated. To the simple root were attached prefixes and suffixes whose force is not always clear, so that a finite verb-form is not a single word but

a concatenation. Take the root *du* = to build'; *Tugul dingir-ra-ni e mu-na-ni-du* means 'The king built a temple for his god.' Some scholars suggest that the S. L. had a series of vocal 'tones,' like Chinese, which distinguished homonyms. For example, *sag*, 'heart,' and *šag*, 'to be gracious,' were probably distinguished in speaking by the pitch of the voice. Two dialects or literary styles are distinguishable in the Sumerian documents—the *eme-ku* or pure speech and the *eme-sal* or broad speech. The latter is used only in religious documents and is distinguished from the much commoner *eme-ku* by certain differences of orthography and pronunciation: e.g. the *eme-ku* for 'god' is *dingir*, the *eme-sal* is *dumir*. See C. J. Gadd, *A Sumerian Reading-book*, 1921; L. A. Waddell, *Indo-Sumerian Seals Deciphered*, 1925; *Sumer-Aryan Dictionary*, 1927, C. L. Woolley, *The Sumerians*, 1929; D. Diringer, *The Alphabet* (2nd ed.), 1949.

**Sumir**, prov. of Babylonia (q.v.).

**Sumla**, see **SUMILA**.

**Summary Jurisdiction**. The S. J. of justices of the peace is a power conferred on justices by various Acts of Parliament to try certain minor offences without the aid of a jury and to make orders for payment of money on *complaint*. There is an appeal to a court of general or quarter sessions against a conviction, sentence, order, or decision of a court of S. J. Either party to the appeal may be granted legal aid (Summary Jurisdiction (Appeals) Act, 1933). See *Stone's Justices' Manual* (ann.). See also **JUSTICES OF THE PEACE**; **POLICE**.

**Summational Tones**, see under **RESULTANT TONES**.

**Summer**, that portion of the year when the pole of the hemisphere in question is inclined towards the sun and thus has its highest temp. In the N. hemisphere summer lasts from the entry of the sun into the zodiacal sign of Cancer, about June 22, till the autumnal equinox of Sept. 21. The summer of the S. hemisphere corresponds to the N. winter.

**Summer Time**, see **DAYLIGHT SAVING**.

**Summons**, in law, a citation to appear in court. It is a written notification, signed by the proper officer, to be served on a person, warning him to appear on a specified day to answer the claim of the plaintiff. In the high court procedure a *writ* of S. is the initial document of a common law action. It contains *inter alia* an endorsement of the nature of the claim made, or of the relief or remedy required in the action, so that the defendant may know why he is sued. In some cases the plaintiff is allowed to state the particulars of his case *in full detail*, but the use of such *specialty endorsed writs* of S., which take the place of a statement of claim, is only permitted in some half-dozen specified cases of liquidated demands (Order XIV. of the Rules of the Supreme Court). An *originating S.* is a document by which any person claiming to be interested under a deed, will, or other written instrument may apply to the court for the determination

of any question of construction or interpretation arising under the instruments and for a declaration of his rights. It is the customary mode of commencing numerous actions in the chancery div. The issue of a *default S.* in the co. court is the ordinary mode of commencing an action for the recovery of a debt in that court. A *judgment S.* is issued to enforce a judgment debt under pain of committal. See also under **POLICE**, **Arrest and Summons** and **Police Courts**.

**Sumner, James Batcheller** (b. 1887), Amer. biochemist. He worked on the chem. of enzymes and proteins, and shared the 1946 Nobel prize for chemistry.

**Sumo**, see under **WRESTLING**.

**Sumperk, Schönberg**, or **Mährisch-Schönberg**, tn. of Moravia (Czechoslovakia, on the R. Tress, 29 m. N.W. of Olmütz. It manufs. linen and silk. Pop. 12,700.

**Sumptuary Laws** (Lat. *sumptuarius*, from *sumptus*, expense) were designed to restrain the expenses of citizens in wearing apparel, equipages, diet, furniture, etc. S. L. were promulgated by Solon in Athens, by Sparta, and by Sulla, Caesar, and Augustus in Rome. In England Edward II. and later kings issued S. L. (see also **MORTON, JOHN**). The last was a Scots law of 1621.

**Sumter**, city of S. Carolina, U.S.A., cap. of Sumter co., 81 m. N.W. of Charleston. It is a trade centre for an agric. region, and exports cotton and tobacco. Pop (1940) 52,400.

**Sumter, Fort**, see **FORT SUMTER**.

**Sun**, the, parent body of the solar system to which all the planets (including minor planets), practically all the comets, and numerous meteor streams belong, has a mean parallax of about 8.790". corresponding to a mean distance of about 92,900,500 m. Its angular diameter at mean distance is taken as 1919.26" corresponding to a real diameter of 864,000 m. It should be pointed out that these values vary according to circumstances. The *Nautical Almanac* uses 1922.36" for the S.'s ephemeris, but the true semi-diameter is based on a value 1919.22", adopted in 1891, which is still used for eclipses; the difference represents the allowance for irradiation which is removed for eclipse purposes. The S.'s mass is taken as 333,434 times that of the earth, whose mass has been calculated to be  $5.89 \times 10^{21}$  tons, so the mass of the S. is  $1.96 \times 10^{27}$  tons. The volume of the S. is 1,300,000 times the earth's volume, but its density is only 0.253 that of the earth, corresponding to a sp. gr. of 1.41. The S.'s surface gravitational attraction is twenty-eight times that of the earth, which implies that a man weighing 11 stones on the earth would weigh 308 stones on the sun, provided the weighing took place on a spring balance. Its equator is inclined to the ecliptic at an angle  $7^\circ 15'$  and to the plane of the earth's equator at  $26^\circ 15'$ ; its axis points approximately midway between the Pole Star and Vega, that is, to a point whose right ascension and declination are 18 hrs. 44 min. and  $64^\circ$  N., respectively. The S. is classed as a G type star and its age is believed to be of

the order 3,000,000,000 years, though it may be considerably more.

**Rotation.**—The density of the S. indicates a gaseous condition, confirmed by spectroscopic evidence, and hence rotation must differ from that of a body like the earth which rotates as a whole. The retardation of the S.'s rotation towards the poles was first observed by Carrington in 1860, and the most recent results largely confirm his figures. The period of rotation at the equator is 24.7 days, in lat.  $45^\circ$  it is 28.2 days, in lat.  $60^\circ$  nearly thirty-one days, and near the poles about thirty-four days. In recent times the spectroscopic has shown that the period at the equator has fluctuated, having increased by two days, and then decreasing again.

So far as it has been possible to classify the phenomena which compose the S., they may be grouped under the following heads: the photosphere (*q.r.*), the reversing layer, sun-spots (*q.v.*), the chromosphere (*q.v.*), and the corona; beyond these is the general question of radiation.

**Reversing Layer.**—Kirchhoff's theory regarding the dark lines in the solar spectrum supposed a layer of gaseous matter, through which light from the photosphere must pass to reach the earth. At the temp. of the S. this would be incandescent, and would give a bright line spectrum if separately observed. This was accomplished in the total eclipse of 1870 by Prof. Young. At the moment of totality, the light of the photosphere being obscured, the bright lines forming the spectrum of the reversing layer were visible as a 'flash spectrum.' Metallic lines are numerous, and the layer, which is continuous with the chromosphere, has a thickness estimated at about 200 m.

**Corona.**—The corona is the uppermost envelope of the S. Attempts to photograph it in daylight were unsuccessful until recent times. A special apparatus is used on a mt. where the turbid layers of the atmosphere are absent. The light from the corona is a pearly white, and it often extends to a distance of twice the diameter of the S. The nature of the corona is not definitely known, and its structure is complex. Its shape is found to vary with the sun-spot cycle, being compact during a period of sun-spot maximum, while huge coronal streamers occur at a sun-spot minimum. According to Perrine (1918), the distribution and form of the coronal streamers are connected with magnetic and electrical phenomena. The light from the coronas is partially polarised, a phenomenon characteristic of light scattered by small particles. Hence some of the light is merely reflected sunlight of light from the photosphere, but the spectrum of the corona reveals a number of bright lines that have not been identified with any known element. The lower portion of the corona contains hydrogen and the light emitted is pale green.

**Radiation.**—The quantity of sunlight has been estimated at about  $3 \times 10^{27}$  candlepower, but less than 80 per cent of this reaches the earth owing to atmo-

spheric absorption; its intensity is given as 150 times that of the limelight. Yet were the S. deprived of its absorbing envelope of gases, it would shine with two to five times its present power, and would appear blue, those rays being most absorbed. The light of the S. distinctly fades towards the limb, the outer portions passing through a greater thickness of absorbing envelope. The temp. of the photosphere has been estimated at  $6000^\circ \text{C}$ . Young states that the heat received from the S. would be sufficient to melt a layer of ice 226 ft. thick on the earth's equator annually; the energy on each square foot of the earth's surface, if utilised in a perfect heat engine, would be sufficient annually to raise a 100 tons to the height of a mile; at the S.'s surface a thickness of 64 ft. of ice would be melted in 1 min. Of the total heat energy of the S. the earth receives  $1/22 \times 10^8$ . Fluctuations in the radiation of the S. have occupied attention with very varying results, and Abbot and his colleagues have shown that the value of the solar constant varies in the period of the sun-spot cycle; it may be as much as 3 per cent higher at sun-spot maximum than at its minimum. Studies of these fluctuations made at Mt. Wilson since 1921 by Peltet showed the important part played by violet and ultra violet radiation. An amplitude of change of 3.5 per cent is frequent, while 10 per cent is sometimes reached. The 'solar constant' expresses the total intensity of solar radiation outside the earth's atmosphere at mean solar distance; simultaneous observations in 1909 and 1910 at Mt. Wilson (1 m. high) and Mt. Whitney (3 m. high) gave values in the former case of 1.943–1.904, in the latter 1.979–1.933 calories per sq. cm. per min. The value usually adopted is 1.93 calories per sq. cm. per min., which is equivalent to an emission of energy of  $3.8 \times 10^{34}$  ergs per sec. The effective temp. of the S. is determined by Stefan's law, Wien's law, or Planck's formula; these enable the physicist to calculate the S.'s effective temp., that is, the temp. its surface would have if it were a perfect radiator. It is not easy to measure the spectral energy curve of the S. because various corrections must be made, amongst which may be noticed the reduction in intensity due to the scattering of the S.'s rays as they pass through the earth's atmosphere. Complications arise from the fact that this effect is more pronounced for the short wave-lengths—blue and violet—than for the longer wave-lengths, and the effect becomes very pronounced when the S. is close to the horizon. By making a series of measurements of the intensity of the S.'s radiation for different parts of the spectrum during various hours of the day it is possible to estimate the amount of sunlight that would be received at different wave-lengths if atmospheric effects are entirely eliminated. It has been found that when the sun is in the zenith, which implies the most favourable conditions, not more than 70 per cent of its radiation reaches sea level. Absorption bands have a great influence in the red and infra-red

spectrum, where the bands of water vapour, carbon dioxide, and oxygen are chiefly found. When the true spectral energy curve of the S. has been determined, the temp. of the S. can be found from Wien's displacement law, which connects the wave-length of maximum emission, expressed in terms of  $\mu$ , which is one thousandth of a millimetre, with the absolute temp.  $T$ , by the formula  $\lambda_{\text{max}} T = 2930$ . The maximum intensity has been found to be in the blue-green region at wave-length 4750 approximately. This is expressed in Angstroms, and the corresponding value in units of  $\mu$  is  $4750 \times 10^{-4}$ . Hence it is easily found that  $T \approx 2930^\circ (4750 \times 10^{-4}) = 6168^\circ \text{K}$ , or about  $5900^\circ \text{C}$ . Extreme accuracy is unattainable in dealing with such high temps., but the figures are probably very close to the true temp.

The spectrum of the S. has shown the existence there of about sixty of the terrestrial elements. The spectrohelio-graph (*q.v.*) has been applied to the study of the separate lines over the S.'s surface, so that, for example, iron or calcium or hydrogen 'layers' of the S. are photographed. The three layers mentioned are supposed to be in that order of distance from the S.'s centre. But further, a study of the separate lines of each element gives some idea of the pressure and temp. conditions at different depths within the S.'s surface. Eddington has shown that the temp. at the centre of the S. must be of the order of 20,000,000 $^\circ \text{C}$ , and from the consequences of the theory of relativity Jeans has shown that the radiation from the S. causes a diminution of its mass at the rate of 4,000,000 tons per sec. The source of the S.'s energy is now supposed to be the transmutation of hydrogen into helium, accompanied by the annihilation of matter (*see STARS*). *See SUN-SPOTS; also CHROMOSPHERE; PHOTOSPHERE; RADIATION; SOLAR SYSTEM; SPECTRIUM.* *See T. E. R. Phillips and W. H. Stevenson (ed.), Splendour of the Heavens* 1923; C. A. Abbot, *The Sun*, 1929; Sir J. Jeans, *Stars in their Courses*, 1931; H. S. Spencer-Jones, *General Astronomy*, 1931; R. L. Waterfield, *A Hundred Years of Astronomy*, 1938; E. A. Beetz, *A Textbook of Elementary Astronomy*, 1915; G. L. Hosmer, *Practical Astronomy*, 1949; and F. Hoyle, *The Nature of the Universe*, 1950.

**Sun Animalcules**, *see* HELIOZOA.

**Sun-arcs**, *see under* LIGHTS, ARTIFICIAL.

**Sun-bittern**, or *Eurypyga helias*, heron-like bird of the family Eurypygidae, which occurs in the N. part of S. America. It is fairly large, and has a long neck, slender bill, and pervious nostrils; the plumage is mottled, but the chief shades are brown, black, and white. It frequents the marshy banks of large rivers.

**Sunbury**: 1. Tn. of Pennsylvania, U.S.A., co. seat of Northumberland co., on the Susquehanna R. It has flour and planing mills, railway workshops, foundries, machine shops, and silk-mills. Pop. 15,500. 2. Tn. of Victoria, Australia, in Bourke co., 28 m. N.W. of Melbourne. Pop. 4,000. 3. Tn. of Middlesex, England, on the Thames, 17 m. S.W. of

London. Here is Kempton Park race-course. Pop. 21,500.

**Sunda Islands**, in the Malay Archipelago, are situated in the Indian Ocean. They comprise Java, Sumatra, Borneo, Celebes, Banka, etc., among the Great Sunda group and in the Lesser Sundas are Bali, Lombok, Sumbawa, and Timor, etc.

**Sunda Sea**, *see* JAVA SEA.

**Sunday**, *see* SABBATH.

**'Sunday Chronicle'**, one of the Kemsley newspapers, was founded in 1885 and caters for the middle-class reader. It is a national newspaper with a long literary tradition, further enhanced when, in 1939, the paper absorbed the *Sunday Referee*, which had always appealed strongly to readers interested in literary and theatrical affairs. The S. C. made newspaper hist. in 1940 by printing simultaneously in London, Manchester, and Glasgow. The sale (1950) is approaching 1,200,000.

**'Sunday Dispatch'**, one of the oldest Brit. newspapers, founded in 1801 as the *Weekly Dispatch*. It campaigned against many social evils and supported a strong armament policy. In 1875 it was bought by Ashton Dilke, and later passed to Sir George Newnes. In 1903 it was acquired by Lord Northcliffe, and is now allied to the *Daily Mail* in the Associated Newspapers group. The S. D. is pub. in London, and has a Manchester ed. Its greatest period of progress was after Charles Eade became editor in 1938, the sale increasing in twelve years from 700,000 to about 2,400,000 (1950).

**'Sunday Empire News'**, national Sunday paper which devotes regular space each week to empire affairs. One of the Kemsley group of newspapers, its general appeal is that of a family newspaper with particular emphasis on sport. Founded in 1881 as the *Empire*, its title was changed in 1917 to the *Empire News*, and in Dec. 1944 to the S. E. N. In sixty years its circulation rose from 20,000 to more than 1,700,000 and to-day is considerably in excess of 2,000,000.

**'Sunday Express'**, Eng. Sunday newspaper, founded in 1918 by Lord Beaverbrook. A newspaper of the Express group, the S. E. is printed simultaneously in London, Manchester, and Glasgow. It is independent in politics. It seeks contributions from the leading figures throughout the world in all walks of life, dealing with outstanding events. The average net sale for Feb. 1950 was 2,859,133.

**'Sunday Graphic'**, Eng. Sunday newspaper estab. in 1915 by Sir Edward Hulton as the *Illustrated Sunday Herald* as a companion to the *Daily Sketch*. In 1923 it was acquired by Lord Rothermere and in 1924 passed to Kemsley Newspapers Ltd. (then Allied Newspapers). The name was altered to S. G. in 1929, is pub. in London, and has a Manchester ed. It is the Sunday counterpart of the *Daily Graphic* with a similar policy and national outlook. The sale (1950) is approaching 1,250,000.

**Sunday Island**, largest of the Kermadec is., 600 m. N.N.E. of New Zealand, 20 m. in circuit. It is uninhabited and belongs to Britain.

'Sunday Pictorial,' first picture Sunday newspaper in England, estab. in 1915 by Lord Rothermere a week before the estab. of the *Illustrated Sunday Herald* (see SUNDAY GRAPHIC). The *S. P.* never lost this initial advantage. Its early issues carried articles on the war by Horatio Bottomley (q.v.). Rothermere's shares were sold in small lots; the present position is that the bulk of the shares of the *S. P.* and of the *Daily Mirror* is held by the same people, and the directors of both are mostly the same, under the same chairman. Between them the two companies control the *Nigerian Daily Times*, the Anglo-Canadian Pulp and Paper Mills, and other companies. The sale (1950) is in excess of 5,000,000 copies weekly.

'Sunday Referee,' see under SUNDAY CHRONICLE.

**Sunday School,** place where religious instruction is given to children and young people on Sundays. S. Ss. are usually attached to a church or chapel. The catechising of the young was adopted by the Christians from Judaic practice, but its application fluctuated in scope at different periods and places. The idea of S. Ss. to rejuvenate religious life was suggested by St. Charles Borromeo and Luther. In eighteenth-century England specific instruction of children by the clergy was generally rare and limited, and many children, especially from the poorest classes, never attended a place of worship. Hannah Ball founded a S. S. at High Wycombe in 1769. About 1774 a Dissenter organised a type of S. S. at Nailsworth, Gloucestershire, but the main impulse towards the foundation of the Eng. S. S. movement came from the Anglican Robert Raikes (q.v.) and his friend Stocks, rector of St. John's. Both founded S. Ss. in Gloucester in 1780. They tried to attract the poorest children, and to give them a good religious knowledge. Raikes taught his pupils reading and writing also, but was primarily concerned with the Scriptures, and never believed that his schools should take the place of day establs., though for his own pupils Sunday was generally the only day available for instruction of any kind. The movement grew rapidly. Wesley gave it wholehearted support. Some Dissenters complained that it broke the Sabbath, but others adopted the idea enthusiastically, and this made some Anglicans suspicious of it. As the Fr. Revolution progressed it was suggested by some that S. Ss. were fostering Jacobinism by educating the poor beyond their station, or by actively inculcating revolutionary doctrines; but generally S. Ss. probably helped to avert an Eng. revolution. Early S. S. teachers were paid, but they are now voluntary.

In 1803 the interdenominational S. S. Union was formed and still continues as the National S. S. Union. During the nineteenth century its members adopted the 'uniform system' of teaching, which led to greater efficiency, but also to rigidity, and in 1902 graded methods were adopted. In recent years teaching by pictures, dramatics, film-strips, flannel-

graph, etc., has been increasingly practised. During the nineteenth century a number of 'secular S. Ss.' were organised by trade union and other bodies, which gave entirely secular instruction to children and adults. To-day the term S. S. is confined to those strictly religious in scope. The movement is important in national as well as religious hist., as providing one of the links between the charity schools and regular and universal elementary education. The World's S. S. Association was instituted in 1907. See G. Venables, *The Gloucestershire Centenary of Sunday Schools*, 1880, and G. Kendall, *Robert Raikes*, 1939.

'Sunday Times,' Eng. Sunday newspaper, founded in 1822 and originally owned by a Mrs. Beer, whose husband owned the *Observer*. It passed to Herman Schmidt, who in 1897 had estab. the *Sunday Special*, this being amalgamated with the *S. T.* in 1904. Its purchase in 1915 by the present Viscount Camrose and Viscount Kemsley was the prelude to a period of rapid development both in circulation and in quality. Lord Camrose was editor-in-chief until 1937, when he was succeeded by Lord Kemsley, the brothers having separated their business interests. To-day the *S. T.* is a leading Sunday quality newspaper. Literary, dramatic, and musical criticism of a high standard has long been a prominent feature of the paper, which is also noted for its regular articles on foreign affairs, politics, economics, finance, art, and films. The sale (1950) is 540,000.

**Sunday Trading and Sunday Closing.** A succession of Acts, including the Sunday Observance Acts 1625, 1677, and 1780, has attempted to regulate business and entertainments on Sundays. The basis of the law as to S. T. is the Act of 1677, which provides that 'no tradesman, artificer, workman, labourer, or other person whatsoever (sc. *ejusdem generis*) fourteen years of age or upwards' may 'do or exercise any worldly labour, business, or work of his ordinary calling upon the Lord's Day, works of necessity or charity alone being excepted.' By an Act of 1871 no prosecution for penalties may be launched except with the consent of the chief officer of a police dist. or of two justices or a stipendiary, a provision which has largely stultified the Act of 1677. 'Tradesman' in the above context means one who carries on the business of buying and selling, so that, according to the decision in *Palmer v. Snow* (1900), barbers were not bound to close on Sundays, and, apparently, farmers were outside the Act (*R. v. Sibbester*). An Act of 1930 provided for the compulsory closing of hairdressers' and barbers' shops on Sundays but this Act was repealed by the Shops (Sunday Trading Restriction) Act, 1936. Public houses can legally be open at certain hours in England; in Scotland each locality decides the question for itself. As regards shops where refreshments or newspapers are sold the law before 1937 (when the above 1936 Act came into operation) was tacitly ignored, and in Jewish quarters Sunday

had long been regarded as the weekly shopping day. The Act of 1936, however, regularised the whole position as to shops and made general provision for closing on Sunday. Exemption orders, however, may be granted in a number of instances (specified in Schedule I); these include the sale of intoxicating liquors; meals and refreshments; table waters; ice-cream; milk; medicines and surgical appliances; aircraft, motor, and cycle supplies and accessories; tobacco; newspapers, magazines, and periodicals; books, etc., from railway bookstalls; guide books, photographic films, etc., at museums, galleries, etc.; games and sports requisites at any place where that game or sport is carried on; fodder; post office business; and the business of a funeral undertaker. Partial exemption orders may be granted (Schedule II.) for the sale of bread and flour, confectionery, and fish. There are also special provisions for holiday resorts for the sale of articles required for bathing or fishing, photographic requisites, toys, souvenirs and fancy goods, books, stationery, postcards, etc., and any article of food. There are special provisions, too, for London concerning street markets, where, having regard to the character and habits of the pop. there, S. C. would cause hardship. Shops for persons observing the Jewish sabbath must be registered for S. T. by the local authority. The Act makes provision for the requirements that must be complied with before any person may be employed on Sunday as a shop assistant (*see under SHOP ACTS* as to hours, and holidays). The Act does not extend to Scotland or N. Ireland. The Retail Meat Dealers' Shops (Sunday Closing) Act, 1936, provides for the compulsory closing of retail meat traders' shops and stalls on Sundays.

The Sunday Entertainments Act, 1932, which was passed in consequence of proceedings taken under the Sunday Observance Acts to recover penalties for opening or making use of a place for entertainment on Sundays where the public pay for admission, empowers the licensing authorities to grant licences for the opening of cinema halls in their areas notwithstanding anything in any enactment relating to Sunday observance, on condition that certain provisions to safeguard the welfare of employees are carried out. Before the Act of 1932 the local authorities allowed cinemas to open on Sundays provided the proceeds went to charity, although, strictly, this practice was illegal under the Sunday Observance Act of 1780. Consequently they were open in some dists., *i.e.* the Co. of London, but closed in others. The Act of 1932 was passed to bring uniformity into the law. The Act does not apply to Scotland or N. Ireland.

Fishing is legally (by an Act of 1861) permissible on Sundays but only for salmon with rod and line. It is an offence to take or kill game on a Sunday, but rabbits are excluded from the Act. *See P. F. Skottowe, Law Relating to Sunday, 1936. See also LORD'S DAY OBSERVANCE SOCIETY.*

**Sunder, Lucas, *see* CRANACH, LUCAS.**

**Sunderbans, or Sunderbands,** name given to the jungle region of swamps and is, in the southern part of the deltas of the Ganges and Brahmaputra, partly in Pakistan and partly in India.

**Sunderland, seaport and co. bor.** of Durham, England, at the mouth of the Wear, on the N.E. Region of Brit. Railways. Including in the municipal bor. Monkwearmouth and Bishopwearmouth, it is the largest tn. in Durham and the largest shipbuilding tn. in the world. The tn. itself is well built, with fine shopping streets, parks in the tn. centre as well as in the suburbs, and the riv. running through. There are plans for a new layout of the centre of the tn. Educational establs. include the Bede Grammar School, a new grammar school at Seaburn, a technical college, training college, college of arts and crafts, and technical college affiliated to Durham Univ. The church of St. Peter at Monkwearmouth dates back to 674, and parts of the original building still survive. The riv. is crossed by three bridges. The harbour and docks are on the seaboard and the riverside quays and staithes within a few minutes' distance from the open sea. The South Docks comprise the North and South Hudson Docks, 40½ ac., and the Hendon Dock, 11 ac. The North Dock, on the N. side of the riv., is a tidal dock of 6 ac. The Corporation Quay is a modern deep-water quay, 1062 ft. in length, in the Wear just above the entrance to the South Docks. Coal was shipped from the Wear in the reign of Richard II. In addition to its great trade in coal and coke exports iron and steel, machinery, paper, coal tar, creosote, oil, pitch, lumber twine, glassware of various kinds, and general cargoes. The riv. is well adapted, with its numerous 'elbows,' for the building of vessels up to 23,000 tons dead weight. The first mention of shipbuilding at S. occurs in 1346. To-day there are nine shipyards on the riv., nearly all of them with a strong 'family' tradition. The three staple industries of shipbuilding, marine engineering, and ship repairing provided work for many subsidiary industries and trades, electrical and other equipment, heavy forgings, etc. A wide variety of other industries include the manuf. of glass, pottery, paper, furniture, agric. implements, vehicles, and chemicals.

The hist. of S. dates back from Saxon times, complicated by the application of the name Wearmouth indiscriminately to Monkwearmouth, or Monk's Tn., on the N. side of the riv., Bishopwearmouth on the south side, and to S. Monkwearmouth was associated with the monastery of Jarrow, but it was destroyed by the Danes in 860 and lay in ruins until the monastery was rebuilt in 1075. Bishopwearmouth had meanwhile grown in importance; the shipping trade steadily increased, and at the end of the twelfth century Wearmouth became a bor. Bishopwearmouth appears to have become identified with S. by the year 700. The older Wearmouth, the Monk's Tn., made little progress and remained agric. until the



first shipbuilding yard was estab. in 1775. The tn.'s first charter was granted by Bishop Pudsey in the twelfth century. The bor. received a charter of incorporation from Bishop Morton in 1634. The iron bridge, built in 1796, was remodelled in 1859 by Robert Stephenson, and was in its turn displaced by the present bridge, opened in 1929. There is an aluminum alloy bridge between two docks, the first of its kind in the world.

S.'s shipbuilding and repairing industry proved of the greatest value in both world wars. A S. firm developed the prototype of a standard ship that became the model for the Amer. mass-produced Liberty merchant ships. Between Sept. 1939 and Sept. 1944 the nine Wear yards built and launched 245 merchant ships, totalling more than 1,500,000 gross tons, or at least a quarter of the merchant tonnage produced in the kingdom during this period. S. itself suffered heavily from enemy bombing. Pop. 180,000.

**Sunderland.** This long-range patrol flying-boat has been the standard patrol aircraft of Coastal Command of the R.A.F. since 1938 and is still in service (1950). It had a splendid record of service throughout the war and Coastal Command S. were responsible for the destruction of a great many enemy submarines. It has a wing span of 112 ft. and usually carries a crew of seven or eight, being capable of patrols lasting more than twelve hours.

**Sundew,** see *DROSER*.

**Sun-dials,** see under *HOROLOGY*.

**Sundsvall,** seaport of Sweden in Väster-norrland, on the E. coast, on a wide bay of the Baltic, 28 m. S.W. of Harnosand. Its harbour is sheltered by Alnö Is. Shipbuilding, saw-milling, steel works, brick-making, and breweries are the chief industries, and a trade is carried on in timber, paper, wood pulp, and fish. The tn. was rebuilt after a fire of 1888. Pop. (1949) 21,800.

**Sunfish,** see *CENTRARCHUS*.

**Sunflower,** or *Helianthus annuus*, species of Composite found in America and cultivated in Britain for its large heads of golden florets. It is an annual and a perennial plant; the perennial varieties spread rapidly. The oil is of great value for margarine and cooking purposes. The residue, after crushing, is used as cattle cake. Average yields in England are about 17 cwt. of seed an acre. The Jerusalem artichoke, *H. tuberosus*, is a related species.

**'Sunflower State,'** see *KANSAS*.

**Sungari, Songari,** or **Sunghwakiang**, large riv. of Manchuria, rising near the Korean frontier, in the Shan-alm Mts., and flowing N.W. to join the R. Namn and then N.E. to join the R. Amur, in about 47° 38' N., 135 m. S.W. of the influx of the Ussuri. Its total length is about 850 m.

**Sungaria,** see *ZUNGARIA*.

**Sunghwakiang,** see *SUNGARI*.

**Sunion,** see *COLONNES, CAPE*.

**Sunium Promontorium,** see *COLONNES, CAPE*.

**Sunkiang,** prov. of N.E. Manchuria,

bordering on the U.S.S.R. The border areas are forested and hilly; in the W. are fertile plains. Timber, millet, kaoliang, and soya beans are produced. The cap. is Mutankiang; Harbin is an important tn. Area 31,185 sq. m. Pop. 4,535,000.

**Sunlight Treatment, or Heliotherapy,** application of sunlight to the prevention, cure, or alleviation of certain diseases. One of the earliest records of S. T. is that in the fifth century the neurologist Celsus Aurelianus prescribed sun-baths for 'chronic affections.' The radiations most useful in S. T. are in the infra-red and ultra-violet regions of the spectrum. The radiant heat given by the infra-red rays dilates the capillaries in the skin. As superficial circulation increases, circulation in more congested parts is relieved, and more white corpuscles, the phagocytes, are conveyed to superficial suppurating wounds, where they ingest bacteria which promote suppuration. The ducts of the sweat glands also are dilated, and so dermal circulation is increased. Ultra-violet rays are absorbed by the skin and blood capillaries, and produce a marked effect on metabolism. In particular they permit the synthesis of vitamin D by the skin. Rats have been kept alive in this way, whereas those on similar diet, but without irradiations, died.

On account of this synthesis of vitamin D, the ultra-violet rays prevent and cure rickets. S. T. has also been extensively used in the treatment of tuberculous joints and bones. In this treatment the direct action of the rays on bacteria plays a great part. Exposure to the sun must, however, be carefully controlled; injudicious exposure may be harmful, for instance, in pulmonary tuberculosis. Sunlight and ultra-violet rays are also harmful to the eyes, e.g. causing 'snow blindness.'

Since ultra-violet rays are readily absorbed by fog and mist and the polluted atmosphere of industrial tns., the best S. T. is obtained at high altitudes. Dr. Rollier's 'school in the sun,' in the Valais Alps, has served as a model for children suffering from tubercular trouble, lupus, rickets, and other diseases.

Ultra-violet rays produce a marked effect on the pigmentation of the skin; but the function of this reaction is doubtful; it may be merely an incidental effect, or it may protect the body from excessive radiation. See also *ULTRA-VIOLET LIGHT*.

See E. Mayer, *Clinical Application of Sunlight and Artificial Radiation* 1926; A. Rollier, *Heliotherapy* (2nd ed.), 1927; P. Hall, *Ultra-violet Rays* (4th ed.), 1929; and F. H. Humphris, *Artificial Sunlight and its Therapeutic Uses* (5th ed.) 1929.

**Sunn,** or **Sunn-hemp**, fibre obtained from the stems of *Crotalaria juncea*, a leguminous plant of the E. Indies.

**Sunnites (Sunnis),** orthodox section of the Muslims. See under *MOHAMMEDANISM*.

**Sunshine Recorders** are instruments for recording the time during which the sun is not obscured by cloud, fog, etc. That recommended by the meteorological authorities of Britain is the 'Campbell-Stokes,' devised by J. F. Campbell in 1853 and improved by Prof. Sir George

G. Stokes in 1879. It has a glass globe which acts as a lens, the sun's image being received on a card in the zodiacal frame. The card is accurately marked in hours and fractions. The concentrated rays of the sun burn a trace as the sun travels across the sky, the breaks showing the periods of obscured sun. Three grooves are provided to receive the cards, one each for winter and summer, and one for autumn and spring.

The Campbell-Stokes sunshine recorder is in general use throughout the world except in America, where an electric sunshine recorder is in use which consists of two air-filled glass bulbs connected by a short tube containing mercury, all enclosed in a vacuum. When the sun shines the lower bulb, which is coated with lamp-black, absorbs more heat than the upper, the mercury rises and closes contact between two platinum wires in the tube which are connected to the recording apparatus. It is also sensitive to diffused radiation so that its results cannot be compared directly with those from the Campbell-Stokes, which records only direct sunshine of strength greater than 0.3 gm. cal./sq. cm./min. Amer. practice is to add a 'low sun correction' when the sun is shining at dawn or sunset and the instrument fails to register; Brit. practice is to record 'bright sunshine' without any correction. Quantitative measurements of the sun's radiation are given by a pyrheliometer (*q.v.*). S. R. do not give a record of cloudiness, which is usually visually estimated, though some indication is given at night by the starshine camera (*q.v.*).

**Sunshine State**, see NEW MEXICO; SOUTH DAKOTA.

**Sun-spots** were discovered by Galileo in 1610, some two years after the invention of the telescope, but independent claims for discovery have been made for Harriot, Scheiner, and Fabricius. They may occasionally be seen with the naked eye by using a darkened glass to view the S. Viewed by means of a telescope, a large number of S. are often visible. They vary greatly in size, some large ones being one-twentieth the diameter of the sun, or five times that of the earth; occasionally groups are found. Schwabe (1843), from observations extending over twenty years, discovered a periodicity of about eleven years; Wolf and Woller after him have completed a record up to comparatively recent times and extending back as fully as possible to 1610. Newcomb from these finds 4.62 years as the period of increase in numbers, 6.51 as that of decrease, the full period being 11.13 years; in each case on the average. The full period ranges between extremes of 7.3 and 17.1 years. Lockyer, Halm, and Woller discovered that the more intense the outbreak of spots in any period the shorter the time required for maximum development and also for subsequent decay. Further, the period from maximum to minimum is always greater than the increasing period. Underlying these periods there is an unchanging cycle. Shuster in a mathematical analysis finds three well-marked

periods of 11.125, 8.32, and 4.77 years. All three are nearly even fractions of 33 $\frac{1}{3}$ , and the sum of the reciprocals of the first two equals the reciprocal of the third. The periodicity of S. is shared by the faculae, the prominences, which are most numerous at sun-spot maxima, the corona, terrestrial aurora, and the earth's magnetic field. There is a close connection between the periodicity of S. and terrestrial magnetic storms (see MAGNETISM), and as the spectrum of the light from a sun-spot exhibits the Zeeman effect (*q.v.*) it is established that there are intense magnetic fields in their neighbourhood. Magnetic storms appear to be distinctly connected with large S., while climatic changes on the earth, such as exceptional rainfall and drought, have been connected with the general periodicity. S. show a marked distribution in lat., occurring mainly between lat. 10° and 30° both N. and S., but seldom outside 40°; or within 0° to 15°. The disturbances producing S. appear to arise about 30° lat. and spread to a maximum in about lat. 16°, dying out in 8° or 10°; before this period has lapsed a new disturbance rises. Very great difficulty is experienced in observing or photographing details of spots on account of the heating of the earth's atmosphere, and much disagreement results in points of importance. Secchi noted the appearance of eruption and bright faculae before the development of a spot. Lockyer considered the spot antecedes the faculae. An umbra and penumbra are noticeable and a 'greenness' precedes the spot development; the form is approximately circular and retains its shape; dissolution commences with bridges of light, brighter than the surrounding photosphere, striking across, and the luminous matter of the photosphere seems to tumble pell-mell into the chasm' (Secchi), leaving faculae which subside. The life of a given sun-spot is short, some disappearing in a few days, while it is an exception for one to exist for a few months. Spots have a small proper motion of their own apart from the sun's rotation, and any change of structure appears to be accompanied by a westward rush.

**Spectrum**.—This is generally weaker than that of the photosphere, particularly in the violet, a result at least partly due to diminished temp.; a strengthening of the line of sodium, calcium, vanadium, and chromium (partly), and a distinct weakening of all the hydrogen and silicon lines; but in the total Fraunhofer lines a strengthening; this points to a coolness of the reversing layer just above the spots. A further evidence of such cooling is the presence of the flutings due to titanium oxide and the hydrides of calcium and magnesium. The work of Hale from 1908, from a study of the Zeeman effect (*q.v.*) in the lines, showed that S. are not of the same polarity, double spots often being of opposite polarity, which is considered to indicate the presence of vortices or whirling motions within the spots. Evershed found that the gases in S. ascended, the speed of the current being greatest for gases at the deepest levels.

At higher levels the direction of flow was found by St. John to be reversed, the gases moving inwards. From a study of a large number of lines he concluded that the outward velocity at low levels was 0.6 m. per sec., and that the velocity decreased at higher levels until a neutral level was reached where the gases were almost stationary. The general modern view of S. appears to be that they are cyclonic disturbances with gases radiating outward at the upper end or huge vortices of electrified particles; into the region of diminished pressure the upper-level hydrogen is sucked and its temp. increased. The vortices are in opposite directions in the N. and S. hemisphere, as are those of the terrestrial atmospheres.

**Sunstroke, Heatstroke, or Insolation**, condition of prostration or fever brought about by excessive exposure to the sun's rays or to a high temp., e.g. in stoke-holds. The primary cause is probably the disturbance of the temp.-regulating centre in the medulla of the brain. The body temp. rises and there are disturbances in the respiratory and circulatory processes akin to those seen in shock. The extent and form of these disturbances determine the various types of the disease. Thus, syncope may be the predominant symptom; the patient is sick and giddy, and ultimately falls into a fainting condition with a very weak pulse. He should be placed in a recumbent position, and efforts should be made to restore the circulation by stimulants, such as ammonia, ether, etc. Asphyxia may be the prevailing symptom, as in the form of S. known as heat apoplexy. This condition is marked by dark flushing of the face, protruding eyes, and stertorous breathing. The best treatment is the application of cold by rubbing the skin with ice. Besides these two well-defined types of S., there are numerous varieties in which different forms of respiratory or circulatory disability are manifest. The treatment should be symptomatic. The form of S. known as heat cramps, or miner's cramps, is caused by shortage of salt in the diet. It is likely that deficiency of salt is a contributory cause in other types of S. also.

**Sun Worship** has been common at all times and in all parts of the world, for the sun is naturally regarded as the source of life. The sun-god was worshipped in Persia as Mithra. In Egypt as Ra, in Greece as Apollo, and under other names in Peru, N. America, and N. Europe.

**Sun Yat-sen** (1866-1925), Chinese statesman and first president of republican China, a missionary convert's son, b. in a farming vil. in Hsiang Shan Hsien in Kwantung, a coolie and the son of a coolie. He was educated at a school in Honolulu (1879-83) and at Queen's College, Hong Kong (1884-86), where he became a Christian. In 1892 he graduated in medicine in Hong Kong.

In 1894, following the outbreak of war between China and Japan, S. went to Honolulu and founded the Society for the Restoring of China (Hsing Chung Hui), and returned to China the next year and

plotted an armed rising, with the projected seizure of Canton as a base of the revolution. But the plot failed, a price was set on his head, and he fled to Europe. He remained there from 1896 to 1898, during which time he developed his political and social ideas by the study of the socialistic literature of England and the Continent. He returned to the E. and lived in Japan from 1898 to 1900, where he met the leaders of the popular parties. During 1906-11 he took part in, or directed numerous up-risings, most of them abortive, but that at Wuchang, on Oct. 10, 1911, was successful, and some thirteen of eighteen provs. responded to the revolutionary call and declared their independence of the Manchu dynasty. Later in the year the newly formed Senate elected him provisional president of the republic and in 1912 the Nanking Assembly inaugurated him president, but he resigned his office after fourteen days in favour of Yuan Shi-kai, the emperor having abdicated and thereby ended over 260 years of Manchu rule in China. But Yuan proved to be a reactionary and a traitor to the republic and in the ensuing few years a bitter struggle went on between his newly organised party, the Kuomintang (the People's party), and the reactionaries under Yuan, who died in 1916. In 1917 S. had himself elected president of a Southern Chinese Republic, at Canton, but he fled before Gen. Chen Chiung-ming in 1922. In 1924 he undertook a radical reorganisation of his party on the model of the Communist party in Soviet Russia. He was converted from Marxist doctrines, however, and thus were laid the foundations of the later struggle between the Communists and the Kuomintang.

S. died in Peking of cancer on March 12, 1925. His greatest contribution to Chinese nationalism lies in the vigour and force of his personal leadership, which revitalised and made it the irresistible driving force, first against the alien rule of the Manchu dynasty and later against foreign domination in China. After his death he became greatly venerated in China. His pubs. include *The International Development of China* (1922); *Memoirs of a Chinese Revolutionary* (1927); and *The Three Principles of the People*.

See N. Gangulee, *The Teachings of Sun Yat-sen*, 1945.

**Suomen maa, Suomi**, see FINLAND.

**Superannuation Schemes** may be divided into two broad classes—contributory and non-contributory. The former, as the name implies, are those schemes where the superannuitant has paid into a superannuation fund a certain ann. per centage from salary during the years of service. In the non-contributory scheme no such levy from salary has been made. The contributory scheme is by far the more generally prevalent. Teachers, local officers, officials in insurance offices, employees of many well-estab. industrial concerns are amongst those who enjoy its benefits. Details of the different contributory schemes vary, but the following cover most of those in operation: (1) definite retiring age; (2) definitely fixed

percentage contributions from salary to the superannuation fund; definitely fixed pension rates payable on retirement. In many cases provision is made for a subscriber to draw *pro rata* rates, if he is compelled for any reason to retire prematurely. Perhaps the best-known example of the non-contributory system is that obtaining in the Brit. civil service. The grant of superannuation benefits to civil servants is regulated by a series of statutes known as the Superannuation Acts, 1834 to 1949. The Acts determine the limits within which the Treasury may grant superannuation benefits, but there is no right to any benefit. All pensions are awarded by the Treasury and the decision of the Treasury on an application for superannuation benefit is final. Until 1909 all estab. civil servants were pensionable under the Superannuation Act of 1859. The Act of 1909 provided benefits calculated actuarially to be approximately equivalent as a whole to those under the Act of 1859, but so adjusted as to secure, at the cost of a diminution of pension on retirement by one-fourth, payment of a lump sum, called an additional allowance, on retirement, together with provision for dependants in the event of death in the service. The ann. pension is calculated on a basis of  $\frac{1}{60}$  of salary for each year of service, subject to a maximum of  $\frac{40}{60}$ . The Act of 1935 defined the calculation of the additional allowance on a basis of  $\frac{1}{30}$  of salary for each year of service, subject to a maximum of  $\frac{1}{3}$ , the salary, in all cases, being the average of the salary received during the last three years of service. Under the same Act women civil servants, who have been pensionable since the Act of 1859, were granted the same bases of calculation (i.e. additional allowance and pension calculated on eightieths) as men. By this, and by sev. other Acts, including that of 1949, modifications and additional payments in cases of differing eventualities have been constituted. These include provision for dependants of various classes, and the Superannuation Act of 1949 set up a completely new scheme of (contributory) pensions for widows and dependants, as well as making amendments to earlier Acts.

**Superfortress**, see FLYING FORTRESS.

**Superheterodyne**, see under RADIO RECEIVERS.

**Superior**: 1. Largest, most elevated, and most westerly of the five Great Lakes of N. America, and the largest body of fresh water on the globe. About one-third is in Ontario, Canada, and the rest in Minnesota, Wisconsin, and Michigan, U.S.A. It is fed by numerous streams, the chief being the St. Louis, and discharges by St. Mary's R. at the E. end into Lake Huron. There are numerous is. The water is very pure and abounds in fish. The length is 420 m., greatest width 160 m., mean depth 900 ft. Area 31,800 sq. m. 2. Cap. of Douglas co., Wisconsin, U.S.A., at the mouth of the Nemadji and St. Louis Rrs., at the W. end of Lake Superior, 6 m. S. of Duluth, with which it shares a good harbour. Iron ore and

copper are exported. There are manufs. of matches, iron and steel ware, and ship and railway wagon building. Pop. 35,000.

**Superior and Superiority**. In Scots law the person who makes a grant of land or a *feu* to a grantee is called the *superior* or *feu superior*, and the grantee is or was called the vassal. If the grantor be himself a vassal his grantee is sub-vassal and he himself mid-superior, while the mid-superior's superior is over-superior in relation to the sub-vassal. The interest retained by the superior in the *feu* is styled *superiority* or *dominium directum*, which interest was originally the ownership of the land subject to the more or less precarious right of the vassal: the interest acquired by the vassal was the *dominium utile*, i.e. the beneficial ownership.

**Supersonics**, vibrations of matter of frequency greater than those of sounds that can be detected by the human ear (see SOUND, *Ultrasonics*). Supersonic speeds (see next article) are speeds greater than that of sound.

**Supersonic Speeds**. Knowledge of motion at S. S. has come in the past from the study of the flight of such projectiles as bullets, shells, and rockets. In 1949 aircraft travelled above the speed of sound, and considerable research effort has now been applied to the problems of supersonic aircraft design. The supersonic aircraft differs from a projectile in the following main particulars: (1) It will normally have a considerably longer duration of flight to fulfil its useful function; (2) it must carry its human cargo safely and thus cannot be subjected to high accelerations in take-off and manoeuvre; and (3) it must be controllable at all speeds up to its maximum and must fly on an even keel. The initial uses for supersonic aircraft will be research and military. Although the human frame is not affected by speed it is affected by high acceleration and pilots will probably fly in a prone position, possibly wearing 'anti-g' (anti-gravity) suits to minimise the effect of the high acceleration and high manoeuvre forces. Before passengers can be carried considerable research will be necessary.

The design of a supersonic aircraft is complicated because the aircraft has to be stable and controllable under three sets of conditions. It must take off, land, and perform the first and last parts of its flight in the subsonic range; it must pass through the transonic range, and must fly safely in the supersonic range. Of the three the problems of transonic range are the most serious as changes in air-flow characteristics are taking place rapidly and erratically. The most important difference between air-flow at supersonic speed and subsonic speed is that at high speed irreversible phenomena, in the form of shock waves, are set up. These give rise to a very considerable increase in drag and thus power consumed, and fundamentally affect the stability problems. For the subsonic range, aircraft of the conventional type with reasonable aspect ratio are preferred. For the transonic

range considerable sweep-back on all surfaces, a low aspect ratio wing, or a combination of the two is desirable. For the supersonic range thin-pointed aerofoils and high fineness ratio fuselages are considered essential. Present opinion indicates that the most satisfactory form is that of a delta wing aircraft. In plan form these aircraft look rather like an obtuse-angled isosceles triangle travelling apex first, or a very squat house. The wing section is pointed, symmetrical and thin, the body blending into the wing to reduce body-wing effects. Control of the aircraft is by unconventional means and takes the form of spoilers or flaps producing drag moments about the thrust line in such a way as to produce a minimum of buffeting. Opinions differ on the best practical method of achieving this. The controls may be operated manually, but would preferably be automatic, or at least boosted, to prevent undue force being required by the pilot.

Existing engines are of the compact gas turbine type, probably with after-burning, rocket, or ram-jet (see JET PROPULSION). The gas turbine is limited by the throughput of air, and reaches maximum efficiency when the air passing through the first stage of the compressor reaches the local speed of sound. Gas turbines cannot be used efficiently for speeds greater than twice the speed of sound. The rocket has great power and increases in efficiency with the speed of the aircraft. Its best use would be as a booster to take the aircraft quickly through the transonic range and enable a ram-jet to take control. A ram-jet is not practical under speeds of about one and a half times the speed of sound, but increases in efficiency with increasing speed of flight. The delta-winged aircraft is practical structurally, but when travelling at high speeds air friction causes heating of outside surfaces, thus affecting material strength, and refrigeration will be necessary. Such aircraft will, of course, be fully paralysed as they will be flying at great heights.

**Superstition**, see IDOLATRY; FOLKLORE.

**Superstitious Uses**, see CHARITIES.

**Super Tax**, first imposed in Britain by the Finance Act of 1909 when Lloyd George was Chancellor of the exchequer, being a further impost on incomes exceeding £5000 per annum, levied on that part which exceeded £3000. S. T. with certain alterations continued to be levied up till the year 1928-29 (payable Jan. 1, 1929) based on the statutory income for the year 1927-28. It was then replaced by the Surtax (see UNDER INCOME TAX).

**Suppé, Franz von (Francesco Cavaliere Suppé Demelli)** (1820-95), Austrian composer of Belgian descent, b. at Spalato (Split), studied under Czibulka, Ferrari, and Seyfried. He settled in Vienna, where he conducted at the Leopoldstadt Theatre (1862-95), for which he wrote nearly thirty operettas. His best-known works are the *Poet and Peasant* and *Light Cavalry* overtures, and the opera *Boccaccio*. For the last thirty years of his life he was director of music at the An der Wien theatre. See study by O. Keller, 1905.

**Supply**, grant of money provided in order to meet the expenses of government by the representatives of the people. The principle that the redress of grievances should be a return for S. granted by Parliament gained practical recognition at the revolution of 1688, when S. was granted annually and the necessity for ann. S. ended the necessity legally to enact that Parliament should meet every year. The power of voting S. is invested in the Commons, but the Lords have the right to reject, but not to amend, such Bills. From this principle arises the system of 'tacking,' that is, making an ordinary measure into a financial one by tacking a financial clause to it. A money Bill, or Bill of S., must, however, receive the consent of Lords and King.

**Supply and Demand.** The economic commonplace that the price of a commodity depends on S. and D. means that the price of commodities must be so adjusted whether consciously or unconsciously as to equalise the demand with the supply; and that, as a general rule, the demand increases with a decrease in price, and, conversely, the demand decreases with an increase in price. Where the supply is absolutely limited (e.g. rare or first eds. of books) the supply is made equal to the demand by increasing the price to such a point that the demand-in-excess is withdrawn; in other words, the so-called *effective* demand then equals the supply. Where the cost of production rises with every additional supply (e.g. under certain conditions coal and wheat) by reason of the greater proportional outlay of labour and capital the supply must be increased to meet every increase in demand. Where the supply can be increased without a corresponding increase in the cost of production (e.g. manufactured goods), prices rise temporarily when the demand exceeds the supply, but fall with the stimulated increase in supply. The conditions of supply of a commodity or service are always to be regarded as independent of the conditions of a demand for that commodity or service; and in speaking of *given* conditions of supply we mean that the following determining factors are assumed to be constant: the character and resources of those who offer the commodity or service, their individual or collective efficiency, and their knowledge of the arts of industry. Similarly, the conditions of demand are said to be *given* when it is assumed that the following determining factors are constant: the resources and the tastes of those who desire the commodity. Neither the conditions of supply nor those of demand are sufficient alone to determine either the price or the amount at which the sale or purchase will be transacted, in all cases the two sets of conditions in conjunction are required to determine the two unknown quantities, price and amount. The price and amount which are determined so as to satisfy conjointly the conditions of supply and those of demand are spoken of as the equilibrium price and the equilibrium amount in reference to these conditions; this does not mean that no transaction takes place except at

the equilibrium price; but that when the equilibrium price and the corresponding equilibrium amount are reached, then the conditions of S. and D. would not tend to produce any readjustment of price. The equilibrium between S. and D. of conditions depends essentially upon the action of producers in anticipating the demand. Generally speaking, the equilibrium price is the average of the varying market prices, which of course presupposes constancy in the conditions of S. and D. during the period over which the average is taken. See A. Marshall, *Principles of Economics*, 1920; W. T. Layton and G. Crowther, *An Introduction to the Study of Prices*, 1933; H. D. Henderson, *Supply and Demand*, 1910; F. Bonham, *Economics*, 1918.

**Supply and Transport**, see *ARMY*. *An Army in the Field*; *ARRIMANCHES*, *HARBOUR OF*; *COMMISSARIAT*, *LINE OF COMMUNICATIONS*; *LOGISTICS*; *MOTOR TRANSPORT*, *MILITARY*; *PIPELINE*; *QUARTERMASTER*; *ROYAL ARMY SERVICE CORPS*.

**Supply, Commissioners of**. The Scots C. of S. first appointed by the Act of Convection, 1667, were for over a century, before co. councils were instituted in 1889, the leading local authority. Their special or primary function was to levy the land tax. In 1857 by the County Police Act they were given the duty through a police committee of providing a co. police force. The qualification to act as a commissioner has since 1851 been either a property or an *ex officio* one, and the surviving duties are few.

**Supra-orbital Neuralgia**, see *under* NEURALGIA.

**Suprarenal Glands, or Capsules**, triangular organs situated above the kidneys. Each consists of a cortical portion and a medulla. The cortex is made up of three layers of polygonal cells called respectively *zona glomerulosa*, *zona fasciculata*, and *zona reticularis*. From the cortex fibrous septa extend towards the exterior of the organ and divide the cells into groups. The medulla consists of polygonal cells and nerve fibres. It is believed that the function of the suprarenal capsules is concerned with pigment production, and a conspicuous symptom of Addison's disease, which is associated with disease of the suprarenal glands, is a bronze discoloration of the skin. Suprarenal extract from the glands of the sheep is used in the treatment of Addison's disease, but still more for checking hemorrhage.

**Supremacy, Royal**, exercise of supreme eccles. authority by the Crown. In theory medieval Church authority descended from pope to bishops, but in practice kings had wielded large administrative powers. R. S. was first enforced in England by Henry VIII. in 1534. Repealed by Marv. it was reimposed under Elizabeth in 1559. R. S. was enacted in Scotland in 1560. In 1689 the Convention Parliament required all holders of office in Church and State to take 'the oath of supremacy.' This oath in its form, however, anecdotally denied the papal supremacy; it contained no positive statement of the R. S. By an Act passed in 1791 it was provided

that no person should be liable to be summoned to take the oath of supremacy, or prosecuted for not obeying such summons. Rom. Catholics, upon taking an oath in which the civil and temporal authority of the pope is abjured, may hold office without taking the oath of supremacy.

**Supreme Council**, see *PEACE CONFERENCE*.

**Supreme Court of Judicature**. The Judicature Act, 1873, united the then existing courts of chancery, queen's bench, common pleas (*q.r.*) (Westminster), and exchequer (*q.r.*), the high court of admiralty, the probate court (*q.r.*), the court for divorce and matrimonial causes, into one S. C. of J. in England. The old London court of bankruptcy remained a separate court until 1881, when it became consolidated with the S. C. of J. by the Bankruptcy Act, 1883. The supreme court consists of two permanent divs., the court of appeal and the high court of justice; the former in two divs. of three judges, each one of which is presided over by the master of the rolls (see *PAPER ROLLS*). The Lord Chief Justice, who is the head of the king's bench div. (*q.r.*) the president of the probate, divorce, and admiralty div., and the lord chancellor (*q.r.*) are *ex officio* judges of the court of appeal, but never sit there, except that the lord chancellor sometimes sits on the opening day of a term. When necessary a judge of the high court (see *PUISNE JUDGE*) may be called in. Except on questions of costs an appeal lies to the court of appeal from every judgment or order of the high court, but only by leave from an inferior court (see *INFERIOR COURT*). The high court of justice exercises an original jurisdiction in all matters formerly dealt with by the old consolidated courts, and an appellate jurisdiction from the co. courts and petty sessional courts. In this appellate jurisdiction the cases are heard by two judges sitting as a 'divisional court' for 'civil paper cases,' or by three judges for 'Crown paper cases,' respectively. Bankruptcy and winding-up work are assigned to particular puisne judges. Admiralty cases are heard before a puisne judge or the president of the probate, divorce, and admiralty div., with or without the assistance of nautical assessors. The judges of the court of criminal appeal are selected from the judges of the king's bench div. (*q.r.*), generally presided over by the lord chief justice.

**Supreme Court of the U.S.A.**, see *UNITED STATES (LAW)*.

**Sur**, see *TYRE*.

**Surabaya, or Soerabaya**, seaport of Java, Indonesia, at the mouth of the Kali Mas R. It was the naval and military headquarters of the Dutch E. Indies. It is served by railway, and petroleum is found near by. There are metal industries and dyeworks. Exports include coffee, kapok, cotton, rice, tobacco, tapioca, and sugar. The tn. fell to the Jap. on March 10, 1942. Allied bombers raided it, the heaviest attack being that on July 22, 1943. After the Jap. surrender S. became a centre of Indonesian Nationalist

revolutionaries. Fighting in S. between Brit. troops and the Indonesians broke out at the end of Oct. 1945 following the announcement by the Allies that a military gov. would be set up. After the murder of Brig. Mallaby Brit. destroyers arrived at S., and Brit. forces soon cleared most of the tn. See JAVA. Pop. 250,000.

**Surajah Dowlah**, nawab of Bengal, captured the fort connected with the Eng. factory at Calcutta in 1756, and shut up his prisoners, numbering 146, in the military prison, 18 ft. square, afterwards known as the Black Hole of Calcutta. For this atrocity he was punished by Chve, who inflicted a crushing defeat upon him at Plassey in 1757.

**Surakarta**, or **Soerakarta**, tn. of Java, Indonesia, on the Solo. It is the centre of the Java railway system, and an important commercial tn. It has the large palace or Kraton of the 'Susuhunan.' Pop. 100,000.

**Surat**, city of Bombay, India, cap. of the dist. of the same name, on the Tapti, 16 m. from its mouth. There is an old citadel and numerous mosques, and the tn. was the chief port of the Mogul Empire in the sixteenth and seventeenth centuries. An Eng. settlement was estab. in 1612, and the East India Company's headquarters were here until 1687. The manuf. of silk and cotton goods is the chief industry. Cereals and cotton are the main products of the dist., which has an area of 1651 sq. m. and a pop. of 881,000. Pop. of tn. 171,400.

**Surds**, algebraical quantities the root of which cannot be exactly obtained. Thus the square root of 2, the cube root of 3, the fourth root of 4 are S. in that the quantity cannot be exactly determined. The above are written in algebraical notation as  $\sqrt{2}$ ,  $\sqrt[3]{3}$ ,  $\sqrt[4]{4}$ . S. are often called irrational or incommensurable quantities. The order of a surd is denoted by the root index, thus  $\sqrt[3]{a}$  and  $\sqrt[n]{a}$  are S. of the fifth and  $n$ th order respectively. S. of the second order are often called quadratic S.; those of the third order *cubic surds*, and those of the fourth order *biquadratic surds*. Two S. may be multiplied together, provided they are of the same order, by taking the same root of the product of the numbers under the root sign, thus,  $\sqrt{3} \times \sqrt{2} = \sqrt{3 \times 2} = \sqrt{6}$ . The reciprocal operation also holds true  $\sqrt{50} = \sqrt{25 \times 2} = 5\sqrt{2}$ , and in this way a surd may be reduced to one of a simpler form; when the S. does not admit of further reduction it is said to be in its simplest form. An expression involving two or more simple S. is called a compound surd; thus  $3\sqrt{a} - 4\sqrt{b}$  is a compound surd.

**Suretyship, Contract of**, see GUARANTEE.

**Surf**, see under SEA WAVES and SWELL.

**Surface**, in geometry. Imagine an infinite number of contiguous points in two dimensions and we have a S. and breadth but no thickness. Any two contiguous regions in space must be separated by a S., and space itself must be bounded by a closed S. A S. is said to close if a point inside it cannot be joined to a point outside by any line without piercing the S.

An open S. is bounded by a line. Any equation in three variables  $x, y, z$  represents a S. The latter is classified by the form of its equation. Thus  $x^3 + y^3 + z^3 = 1$  is called a cubic S. or one of the third order. A S. of the  $n$ th order is cut by any right line in  $n$  points, real or imaginary, and a plane cuts it in a line of the  $n$ th order. Investigators have dealt with S. of orders up to the third fairly fully, but no pub. has appeared on S. above the third order. Cones, cylinders, and other S. which are cut out by a right line moving in some assigned manner are called 'ruled' S. See SPHERE; CYLINDER; ELLIPSOID.

**Surface Tension**. Many phenomena show that liquids behave as if they were enclosed in a stretched membrane. The shapes of drops slowly forming at the end of a water tap may be imitated approximately by pouring water into a hoop across which is stretched a thin sheet of rubber, showing that the real drops of water behave as if enclosed in an elastic membrane. It may be demonstrated theoretically that the shape assumed by a given volume of liquid so that its surface area is a minimum is a sphere. Small drops of mercury spilled on a table likewise assume the spherical form under the influence of the S. T., though large drops deviate from this shape because of the effect of gravity on them. The spherical shape adopted by soap bubbles whose weight plays a negligible part is also due to S. T. The effect of S. T. is due to the different conditions that obtain at the surface of a liquid compared with the conditions in the body of the liquid. At a point in the interior of the liquid, a molecule is subjected to the attractions of neighbouring molecules that on the whole are equal in all directions. A molecule near the surface, however, is subjected to downward attractions by the molecules below it that are much greater than any attractions due to momentary visitations of the gaseous molecules above it. The surface film exists only in this sense: that the molecular attractions cause the liquid to behave as though it were enclosed by a membrane. The capillarity (q.v.) of liquids (an essential for the life of plants and trees) is due to S. T. Different liquids have different S. Ts.; petrol dropped on water reduces the S. T. of the film covering a pool, a fact of great practical importance in destroying the larvae of the mosquito that can hang from the surface of clean water when breathing.

See, for qualitative descriptions, C. V. Boys, *Soap Bubbles*, 1920, and W. Bragg, *Concerning the Nature of Things*, 1952; the quantitative aspects of the subject are discussed in J. H. Poynting's and J. J. Thomson's *Properties of Matter*, 1920; in N. K. Adam's *The Physics and Chemistry of Surfaces*, 1930; and in E. K. Rideal's *Surface Chemistry*, 1930. See also R. S. Burdon, *Surface Tension and the Spreading of Liquids*, 1919.

**Surf-bird**, or *Apriza virgata*, species of Charadriidae closely related to the turnstone. Its plumage is brown with white markings, and the bird occurs on the Pacific coasts of America.

**Surgeons, Royal College of, see ROYAL Surgery,** that branch of the healing art in which operative measures are relied on. Strictly speaking, the science of medicine involves only those methods of procedure consisting of the administration of substances which, by becoming incorporated into the bodily system, are expected to induce such changes as will lead to the diminution or cure of the disease. S., in contradistinction, involves actual manipulation of the part, either with the hand or with instruments. The term medicine is, however, usually held to embrace the whole science and art of healing, together with contributory sciences. As knowledge of the human frame and of the agencies which affect it for good or evil extends, so does it become more difficult to treat of S. as a separate science or a separate branch of practice. The administration of drugs as a therapeutic measure merges into inoculation with anti-toxic sera and other substances, and also into the application of such agencies as electricity, heat, cold, X-rays, etc. It is then not a long step to methods of treatment involving vibration, massage, etc., with a view to inducing changes in the chem. of the body. Practically the only measures that are popularly regarded as surgical are those involving the removal of diseased parts and substances foreign to the normal organism. Although modern practice in medicine and S. has many inter-connecting features, the two arts have a separate hist., and at some periods there has been a hostile relationship between practitioners of the kindred methods.

The beginnings of S. may be studied in the practices of native tribes. Wounds are dressed, foreign bodies removed by hand or by cutting, dislocations reduced, fractures set and bound, while in desperate cases amputations are resorted to. Experience quickly shows them that a diseased part is a pain and a danger, and that the natural recuperating powers of the body are aided by the removal of a desperately diseased portion. The early civilisations of Egypt, Greece, Mesopotamia, India, and China found a place for the surgeon in their social organisation, and such operations as incisions for the removal of dropsical fluids, amputations with subsequent treatment of the stump with boiling oil or pitch, the removal of concretions from the bladder, trepanning of the skull, etc., seem to have been practised at a very early period. The science of S. was transmitted to Europe by Byzantine writers, and somewhat later by practitioners who followed the Arabian tradition. The Dark Ages added little to the surgeon's art, which was confined to the monasteries, where collections of books of a scientific character enabled the clergy to minister to the needs of the pop. As with medicine, however, monastic surgical science became impregnated with superstition. The lancet was the only instrument in common use, and the practice of bleeding for any and every complaint was controlled by the observation of the changes of the moon and such phenomena. For some reason the monks

were interdicted from the practice of S. in 1139 and again in 1163, but the interdict was not wholly effective. In 1540 the two callings of barbery and S. formerly practised by the same individuals, were separated, though the same guild controlled both. Throughout Tudor and Stuart times the surgeons shared in the prosperity of physicians and were favoured with the confidence of the higher classes. The greater power of the physicians' organisation enabled them to restrict the practice of surgeons, and it was enacted that no major operation, that is, an operation involving danger to life, should be attempted without the presence of a physician. In 1745 the surgeons seceded from the Barber-Surgeons Company and formed the Company of Surgeons, which estab. the Surgeons' Hall at the Old Bailey. In 1800 the old company became the Royal College of Surgeons (*q.v.*).

With the more efficient organisation and the improved methods of surgical education the profession improved considerably in status. In the nineteenth century progress in anatomical knowledge led to the tendency to specialise, which is still operative. The introduction of anaesthetics greatly enlarged the scope of S. Actual speed became of smaller importance, and the knowledge resulting from careful and methodical operations resulted in a wider range of surgical possibilities. The inauguration of antiseptic methods by Lord Lister is on the whole the most important item in the events of surgical hist. The mortality due to operative infection diminished enormously, and surgical methods gained much wider confidence. As a result of Lister's work, the abdomen and later the thorax and the brain have come within the prov. of the surgeon. Joints, even the knee joint, which was formerly notorious for its liability to infection, are opened with impunity, whilst fractures are reduced by the 'open' method which involves an incision.

Considerable progress has been made recently in the S. of the autonomic nervous system, with its two divs. of sympathetic and parasympathetic. The functions of these two divs. are opposed to one another; for instance, the sympathetic system when stimulated causes contraction of the arteries, whereas the parasympathetic has the opposite effect of expanding these vessels. Consequently surgical removal of part of the sympathetic chain results in dilatation of the corresponding arteries, as was exemplified in the operation of lumbar sympathectomy performed in 1949 on King George VI. by Prof. (now Sir) James Learmonth, of Edinburgh. Mention should also be made of the recent advances in plastic S., resulting particularly from the experience gained in both world wars and continuing the work of such pioneers as Tagliacozzi; extensive grafting is now performed, not only of skin but also of underlying tissues such as fascia, cartilage, and even bone. Abdominal S. has become increasingly daring and radical, as witnessed by the operations of Prof. Grey



Turner, of Newcastle and London, and of the Chicago School. In thoracic S. such operations as removal of a lung (pneumonectomy) are possible, and congenital defects of the heart are being corrected surgically by Helen Taussig and Blalock in the U.S.A., by Brock at Guy's Hospital and by Mercer at Edinburgh. Great progress has been made also in orthopaedic S., in which branch the names of Hugh Owen Thomas (inventor of the Thomas splint) and his pupil Sir Robert Jones, both of Liverpool, will be especially remembered. As an example of a modern orthopaedic procedure may be mentioned the operation for lengthening a leg, which is now possible up to a maximum of as much as 5 in. See also LARYNGOSCOPE; LISTER; LITHOTOMY; X-RAYS.

See H. Graham, *Surgeons All*, 1939; R. A. Leonardo, *History of Gynaecology*, 1944; D. Guthrie, *History of Medicine*, 1945; F. G. Slaughter, *The New Science of Surgery*, 1918; and S. Stevenson and D. Guthrie, *History of Otolaryngology*, 1919.

**Suricate**, see MEERKAT.

**Surinam**, see DUTCH GUIANA.

**Surinam Toad**, see PIPA AMERICANA.

**Surkhan-Darya**, region of the Uzbek S.S.R., in the S.E., with the Tadzhik S.S.R. on the E. and Afghanistan on the S., where the Amu-Darya forms the frontier. The railway from Stalnadbad to Termez and Kelif traverses the region. Termez is the cap.

**Surplice** (Lat. *superpellicium*), above the fur dress), loose white linen garment with wide sleeves, worn over the cassock by clergy and certain of the laity at choir offices and at certain other times. The Anglican S. reaches to the knees, is pleated from the yoke, and made with simple sleeves. The Rom. Catholic S. is usually ornamented with lace and reaches only to the hips. The older form, however, is becoming more popular in many Rom. Catholic churches. The S. was once worn over furs by priests when conducting service in cold churches.

**Surrealism**, art movement expressed largely in painting, though possessing much influence in sculpture and literature. Its main tendency consists in the relation of forms and symbols seldom found together in everyday life, producing dream-like sensations or an expression of the subconscious. Charles Madge called it 'a method of dealing with the irrational without sacrificing a rational point of view.' S. is an essentially romantic movement, enjoying its full flowering in the nineteen twenties, but it can claim roots as far back as the fantasy and symbolism of Bosch and Brueghel, and affinities in the last century with Henry Fuseli, and later Gustave Moreau and Odilon Redon. Among the first exponents of S. in the present century was Giorgio di Chirico, who was painting his strange landscapes and prancing horses before the First World War. S. owed much to Dadaism and Vorticism, which had arisen towards the end of the war, and resulted in the work of Max Ernst and the charming and witty paintings of Paul Klee (q.v.) and Joan Miró. Marc Chagall

gained colourful and humorous inspiration from peasant life, and Salvador Dalí, with his meticulously painted work, achieved not only artistic but considerable commercial success. For a time Picasso worked along surrealist lines. In England the movement is reflected particularly in the work of Edward Wadsworth, Roland Penrose, Edward Burra, and in the stage designs of Leslie Hurry.

**Surrender**, see CAPITULATION.

**Surrey, Henry Howard, Earl of** (c. 1517-1547), Eng. poet, the son of Lord Thomas Howard, afterwards duke of Norfolk (see below). He was earl marshal at Anne Boleyn's trial in 1536, and the same year accompanied his father against the Yorkshire rebels. He took part in the unsuccessful siege of Montreuil in 1544, and when commander of Boulogne in 1545-46 was defeated at St. Etienne. He was imprisoned on a charge of treasonably quartering royal arms (these were the mythical Arms of the Confessor), and executed on Tower Hill. S. seems to have been a disciple of Wyatt, but he was the better artist, and also was more dominated by the Petrarchian convention. The elegiac tone is natural to him, and he is distinguished by a love for nature, mingling with personal feelings in his love sonnets. It is in some impersonal sonnets, however, as that on Sardanapalus, that his merit best shows itself. For the sonnet on the lt. model cultivated by Wyatt, S. substituted the less elaborate and easier Eng. form which Shakespeare afterwards adopted, of three quatrains with different rhymes, ending with a couplet. But his chief claim to fame is that he introduced blank verse, of five iambic feet, into Eng. in his trans. of the second and fourth books of the *Æneid* (reprinted 1814). Eng. poetry thus acquiring a magnificent instrument which, once perfected, became the metre of epic and drama. S., like Wyatt, was much in advance of his time, and a whole generation passed before his lead was followed. His *Description and Praise of his Love Geraldine*, together with forty other poems, was printed in Tottel's *Songes and Sonettes* (1557, ed. H. E. Rollins, 1928-29). See ed. of his poems by F. M. Padelford, 1920, 1928, and E. Bapsi, *Deux gentilshommes—poètes de la cour de Henry VIII.*, 1891; also G. Bullett (ed.), *Silver Poets of the Sixteenth Century*, 1917.

**Surrey, Thomas Howard, Earl of**, and **Duke of Norfolk** (1473-1554), took part in the battle of Flodden in 1513, and as warden-general of the Marches devastated the Scottish border and forced Albany to retreat in 1523. Having already held the positions of lord-lieutenant of Ireland in 1520-21 and lord treasurer in 1522, he was made earl marshal in 1533. He was, however, ousted from favour by Hertford, and condemned to death, but Henry VIII.'s death prevented his execution, and on Mary's accession he was released. See also HOWARD.

**Surrey, S.E. co. of England**, lying S. of the Thames, and bounded W. by Berkshire and Hampshire, E. by Kent, N. by Middlesex and London, and S. by Sussex.

It is about 40 m. from E. to W., and about 27 m. from N. to S., with an area of 449,216 ac. and a pop. of (1939) 1,418,600. Ten members are returned to Parliament from the co., and nine from bors. Although one of the smaller cos. in area, Surrey is densely populated near London, where a large proportion of its pop. lives. Its surface is greatly undulating and hilly in parts, the N. Downs passing through the centre of it. From the Thames valley the land rises steadily until, along the Farnham-Guildford-Dorking-Redhill road, which divides the co. into N. and S., the highest points in the N. Downs are reached: Box Hill (590 ft.) at Dorking (789 ac. being owned and 288 ac. protected by the National Trust), and Leith Hill (967 ft.), about 3 m. S. of that in, the best known and highest in the S.E. of England, Hindhead and Botley Hill, from all of which splendid views of the surrounding scenery can be obtained. In between Box Hill and Leith Hill lies a chain of land marks, from the Devil's Punch Bowl in the W. under Hindhead (895 ft.) to Woldingham in the E. (797 ft.), while S. of the dividing road the land falls away sharply to the weald of Sussex. The soil differs considerably in different parts of the co.; in the extreme S.W., around Hindhead, are wide tracts of barren heath. The N. Downs are chalk, and elsewhere the soil is rich, and is mainly under corn and grass. Market gardening is extensively carried on in the Thames valley. Hops are cultivated to some extent near Farnham; fuller's earth is found in the neighbourhood of Reigate. Paper mills on the Wandle, lavender-growing at Mitcham, and flower-gardening are old-established activities. Sheep are reared on the Downs. Besides the Thames the co. is watered by the Mole, Wey, and Wandle, and each of the Thames tribs. has its own tribs. The chief tns. are Croydon, Richmond, Wimbledon, Kingston, Reigate, Guildford, Farnham, Godalming, and Woking, which have various industries, but the bulk of the manufs. is carried on within the limits of Greater London. There are fine botanic gardens at Kew, which contain an important observatory. At Richmond is a fine public park; there are race-courses at Epsom and Hurst Park, near Molesey. Croydon, Brooklands, and Dunsfold have aerodromes. Of the historic houses, such as Claremont at Esher or Nonsuch on the Epsom road, or Addington near Croydon, little is left. Sutton Place, Clondon, Albury Park, and Peper Harow, all of them near Guildford, and Denbies near Dorking, are fine Surrey homes.

The most important events in the hist. of Surrey are the defeat of the Danes by Ethelwulf at Ockley in 851; the crowning of seven Saxon kings at Kingston between 901 and 978; and the signing of Magna Carta by King John at Runnymede in 1215. Traces of Rom. occupation are to be found in various parts of the co., and there are villas at Ashstead and Titsey. The only Rom. roads are such bits of Stane Street, from Chichester, as survive at Ockley and

Dorking, and of a section between Godstone and East Grinstead. The chief historical remains are Farnham Castle, Guildford Castle, the ruined castle built by Wolsey on the S. bank of the Mole at Esher, and the abbeys of Waverley and Newark, also in ruins. Wm. de Warenne was the first Norman earl of Surrey, and sheriff of both Sussex and Surrey. The earldom continued in his family till the reign of Edward III., when it devolved on the FitzAlans and Mowbrays, and thence to the Howards of Norfolk. The earldom of Surrey is now held by the dukes of Norfolk. See W. Jerrold, *Surrey* (Dent's Co. Guides), 1901; E. Parker, *Highways and Byways in Surrey*, 1908, and *Surrey*, 1947; G. C. Harper and J. C. Kershaw, *The Downs and the Sea: Wild Life and Scenery in Surrey, Sussex and Kent*, 1923; G. Home, *The Charm of Surrey*, 1929; D. C. Whimster, *Archæology of Surrey*, 1931; F. J. C. Hearnshaw, *The Place of Surrey in the History of England*, 1937; and A. Mee, *Surrey*, 1938.

**Surrey Regiment, East**, formerly the 31st and 70th regiments. The 31st, raised in 1702 as Marines, did good service in various parts of the world, it became a foot regiment in 1715 and fought at Dettingen, where it gained its nickname of 'Young Buffs.' It served in the Amer. War of Independence, and later under Wellington in the Peninsula, then had a distinguished career in India. The 70th was raised in 1758 in Glasgow, and nicknamed 'Glasgow Greys.' It served in the W. Indies and Canada, in 1863-1866 in the Maori wars, and in the Second Afghan war, 1878-79. In 1881 the two regiments were linked to form the present regiment, which served in Egypt and the S. African war (1899-1902). During the First World War it raised eighteen battalions, which served in France, Flanders, Italy, Macedonia, Egypt, Aden, Mesopotamia, and N. Russia. In the Second World War the regiment fought in France in 1910, and in Africa, Sicily, and Italy. A battalion served throughout the Malayan campaign with the 6th Indian Infantry Brigade.

**Surrey Regiment, West (The Queen's Royal Regiment (West Surrey))**, the old 2nd Foot, raised in 1661 for service in Tangier, and under Charles II. called the Tangier Foot. Its roll of honours is a long one, having participated in operations in Tangier (1662-80), Namur (1695), Egypt (1801), Peninsula (1808-14), Afghanistan (1839), S. Africa (1851-53), China (1860), Burma (1885-87), S. Africa (1899-1902). It was granted naval buttons in commemoration of its service in Lord Howe's fleet on the Glorious 1st June, 1794. During the First World War it raised twenty-five battalions, which served in France, Flanders, Italy, Gallipoli, Egypt, Palestine, Mesopotamia, and N.W. Frontier, India. The regiment also fought in the Third Afghan war of 1919. In the Second World War three battalions formed the 169th Brigade of the famous 56th London Territorial Div. and served in N. Africa. It took part in the landing in Salerno Bay (Sept. 1943) and

later fought on the Garigliano R. and in the debouchement into the plain of the Po. They attacked on April 11, 1941, along the shore of Lake Comacchio and took Bastia, and then, crossing the Lower Adige, reached Gorizia (1945), when the campaign ended. Other units of the regiment fought in Burma and the battle of Normandy.

**Surrogate**, one appointed by the chancellor and the archdeacon in a diocese to act as their deputies in granting marriage licences. He is also empowered to take affidavits in matters within the jurisdiction of these principals, and any other judicial business which he may be specially deputed by those principals to perform. The appointment is regulated by Canon 128 and the Statute 4 Geo. IV, chap. lxxvi., sect. 16. According to Canon 128, a S. must be 'either a grave minister and a graduate, or a licensed public preacher, and a beneficed man near the place where the courts are kept, or a bachelor of law or master of arts at least, who hath some skill in the civil and ecclesiastical law, and is a favourer of true religion, and a man of modest and honest conversation,' and any chancellor, commissary, or other eccles. judge who appoints a non-qualified person as his S. is liable by the same canon to suspension and censure.

**Surtees, Robert Smith** (1803-64), Eng. novelist, educated at Durham Grammar School. S. was articled to a solicitor, and duly qualified, but money came to him from the death of a relative, which enabled him to give himself up to the life of a sporting gentleman with journalistic and literary tastes. He founded the *New Sporting Magazine* in 1831, and there appeared his episodes in the sporting career of Jorrocks, a character who achieved lasting fame. They appeared in book form in 1838 as *Jorrocks's Jaunts and Jollities* (Everyman's Library, 1929), and Jorrocks figured also in *Hindle Crag* (1813, 1851). S.'s spirited writings combine humour, realism, and fancy, not unlike the Dickens of *Pickwick*. His other works include *Mr. Sponge's Sporting Tour* (1853) and *Mr. Pacey Romford's Hounds* (1865). See study by F. Watson, 1933.

**Survey, Courts of**, courts created by the Merchant Shipping Act, 1876, to prevent unseaworthy or overloaded ships from going to sea. The Merchant Shipping Act, 1891, which replaces the above Act, provides for the constitution, powers, and procedure of C. of S. By these provisions a C. of S. for a port or dist. is to consist of a judge, sitting with two assessors (see remarks on expert witnesses under EVIDENCE). The functions of the court are to act as a court of appeal from the decision of the Ministry of Transport as to the seaworthiness of any particular ship. (See MERCHANT SHIPPING ACTS, Part V., *Safety*.) The court also acts as a court of appeal from the refusal of a 'certificate for clearance of an emigrant ship and in other matters relating to safety at sea. Every case must be heard in open court. Where the Ministry of Transport think that an appeal involves a question of construction or design, or of

scientific difficulty or important principle, they may refer the matter to scientific referees approved by a secretary of state, and such referees will act instead of, and have the powers of, a Court of Survey.

**Surveying and Levelling**. Surveying has for its object the attainment of a mathematically accurate idea of the relative positions of all points on any portion of the earth's surface in such a manner that they may be plotted on a map or plan to some scale. Levelling, a branch of surveying, ascertains the relative vertical heights of points with regard to some datum level, such as mean sea level. Surveying may be of various kinds, each requiring various methods and degrees of accuracy; e.g. cadastral, topographical, hydrographic, photographic, geological, mining, and geodetical. The simplest form of surveying may be called *property surveying*, which is concerned with quite small plots of land. When boundaries are rectilinear the *chain* (*q.v.*) is the chief instrument. In Britain two forms are used. Gunter's and the 100 ft. Gunter's chain is 66 ft. or 4 poles long, each link being 7.92 in., and is adopted for most work except quite small tin plots. It has assumed a definite pattern by differently shaped brass tabs; at each end is a convenient brass handle. In most other countries the decimeter chain is used. With each chain ten arrows or iron skewers are carried to place in the ground at each chain length. Where the lines to be measured are not rectilinear, the chain is used to give a line from which 'offsets' may be measured to important points by means of the offset staff, of ten links' length, total 6 ft. 7.20 in. To mark out lines flagged poles, 10 to 20 ft. long, are used; ranging rods, often of the same length as the offset staff, painted over each tenth with different colours, are also carried, together with bundles of laths; whites or thin sticks, 15 in. to 3 ft., with clefts for paper, to be used for small ranging; and a 33-ft. tape. It is usual to assign these implements to definite members of the surveying party, and carefully to organise, in every detail, the routine work. In using these instruments all measurements must be horizontal, not following unevenness of the ground, since they are finally plotted on a plane surface. If the unevenness or slope is not great stepping is the simple method adopted, the chain being stretched to the horizontal, its raised end being projected on to the ground by means of a plumb. When greater, the angle is taken with a clinometer (*q.v.*). The main lines of measurement, or base lines, should be central and intersect one another, thus giving checks; within the net thus marked subsidiary chain lines are taken forming triangles. Where possible as in this, rectangles may be laid out, but in general the triangle is the figure plotted, its dimensions being easily checked by calculations from simple trigonometrical formulae. The nearer this triangle is to the equilateral the better; small angles should be avoided. It is further usual to arrange ties or lines across the triangles, the intersections forming useful checks to the other

measurements. Fig. 1 shows a method of measuring an inaccessible interior area by surrounding chain lines; the lines are produced forming chain angles; the angles A, B, C, D are checked by the tie lines shown at the angles. The true outline of the area is then found by offsets from the prin. lines. It should be clear that great saving in labour may be gained by a careful reconnoitre of the area to be surveyed;

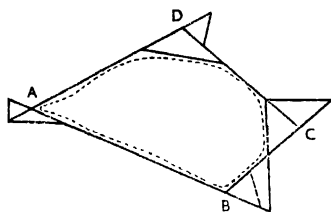


FIG. 1. MEASUREMENT OF AN INACCESSIBLE INTERIOR AREA

there is always a simplest accurate design. The devices are innumerable, but one may be illustrated in connection with inaccessibility. Fig. 2 shows a method of finding the distance across a riv. between the stations B and C; the triangle BCB has a right angle at C and Cb is measured; Cb is produced to D and bD made equal to it; Dc is set off at right angles to bD

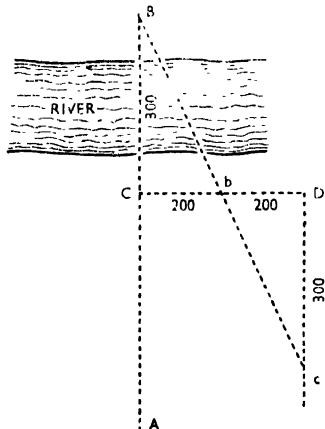


FIG. 2. MEASUREMENT OF DISTANCE ACROSS A RIVER

and c obtained by sighting through b to B. It is clear that  $Dc = BC$ , the distance which cannot be chained. There are two great difficulties in chain and offset work: uneven ground and inaccessibility, and the labour in covering extended distances. To obviate these triangulation is resorted to completely; any measurements are taken which will enable the complete

determination of the triangle (see TRIGONOMETRY). Some means of measuring the angles is employed, the simplest of which is the use of the plane table, incorporating a telescope or slotted sights at the ends of a ruler. A trough compass, to give the magnetic meridian, and

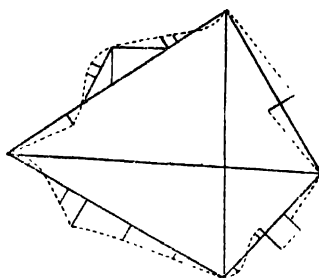


FIG. 3. SURVEY OF AN IRREGULAR AREA

a spirit-level are provided. From any station a sight to a distant station c is taken and its direction ruled immediately without reading off the angle. Fig. 3 illustrates the survey of an irregular area, the prin. lines ABCD being the figure rectangular approximation checked by the lines A-BD.

*Field Book.*—All observations are here entered while in the field. Everything is

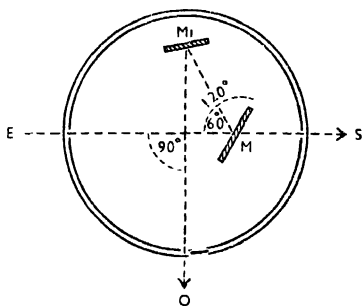


FIG. 4. OPTICAL SQUARE

arranged for ease of entry and computation afterwards, but particularly so that easy checks are provided as the work of observation proceeds. On the organisation of the field party and that of the observations entered in the field book depends the rapidity and accuracy of the survey, and much ingenuity is shown in methods which eliminate personal error and reduce the chance of mistakes to a minimum. In large surveys the field book is dispatched to headquarters, where it is used by draughtsmen in the plotting of the maps, the actual observer not being

consulted. This necessitates uniformity in the plan of field books.

The use of instruments for angular measurement, while lessening the difficulties and labour of chain survey, has its own troubles. Portability is an essential to such instruments, and great refinements are necessary in their construction if accuracy is to be secured, since a small inaccuracy in angle may mean quite a large and impermissible one in linear measurement. For this reason the cross-staff with sighting slots has largely gone out of use; it is a cylindrical or octagonal box on a rod, and has slots to give sights of  $90^\circ$  or  $45^\circ$ , and sometimes has its upper part capable of rotation, a scale showing the angle. The optical square (Fig. 4) gives a right angle, as required for offsets; a sight is taken along the chain line ES through the lower unsilvered part of M, placed at  $120'$  across ES. The mirror  $M_1$  is placed at  $45^\circ$  to E, and by walking along the chain line ES until the object O is reflected from M and  $M_1$ , appearing exactly over the direct image of S and then to the eye, the rectangular position of O is obtained. An angle of  $180^\circ$  is required to determine when the observer is exactly in line between two flags; for this purpose a line-ranger, consisting of two prisms, arranged, as shown, in the centre piece of the Marindin telemeter, is used; the true alignment is obtained when the images of the flags coincide. Of all instruments the theodolite (*q.v.*) is the most complete, its arrangement of a telescope on a vertical circle on which it rotates as a diameter, these being mounted on a horizontal circle, allows any angle from a point to be taken for all points of the compass and for a large range above or below level. The dumpy level (*see LEVEL*) is one form of instrument used for levelling only. The clinometer is used for taking angles of elevation or depression, and is cleverly arranged for hand use. The most popular form is the Abney level in which the telescope carries two quadrants fixed to it, a spirit-level being capable of rotation round the middle of their common diameter; the level has an arm projecting into the graduations of the quadrants, and reading is carried out with the help of a vernier. The bubble with the level when central is visible through the telescope by reflection from a mirror, so that when the object and bubble are simultaneously visible, the height above horizon is shown on the scale. Another handy instrument, the box sextant, is very largely used for horizontal angles; for its theory *see* SEXTANT. Fig. 5 shows the prismatic compass; it carries a magnifying prism and sighting arrangements B and C, and silvering on the prism slope reflects to the eye the graduations on the compass card. For traversing the instrument is particularly handy and useful; at one reading, without adjustment, it gives the bearing of an object, *i.e.* its angle with the magnetic meridian. The telemeter (*q.v.*) is also used for rapid work over short distances. Many of the above instruments are combined; the patterns are innumerable and patent devices for labour-

saving and convenience, or for special work, such as curve-ranging, are added. The immediate advantage of angular survey is in the lessening of ties and checks in the triangles, the summing of the angles to  $180^\circ$  giving practically all that is necessary. It is customary, therefore, to start from a very carefully measured base and rapidly to cover with as large triangles as are compatible with accuracy the whole area to be mapped; the details of each triangle are then worked out by chain survey. For property surveying, steel or 'Invar' (an alloy of steel and nickel with coefficient of expansion less than one-tenth that of steel) tapes or wires of 100 ft. or 21 metres are used. They have the further advantage over rods in that wound on reels they can be dispatched by post for testing to the National Physical Laboratory, etc.

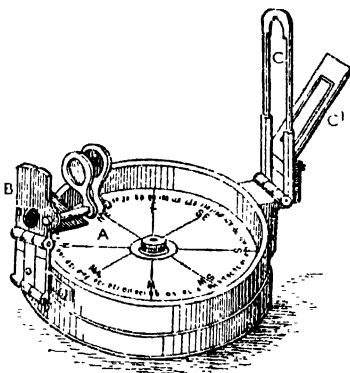


FIG. 5. PRISMATIC COMPASS

**Base-line Measurement.**—Two stations are selected, slightly elevated for convenience of sighting other points, from 1 to 12 m. apart. Terminals are sunk here, pillars erected firmly, and the ends of the base-line marked thereon. Between these firm tripods carrying small pillars are aligned, at equal distances, convenient for each tape measurement. The tape is stretched between these in turn, over frictionless pulleys, by means of weights suspended from straining trestles; an accuracy of 1 in 200,000 is obtainable and is sufficient for all topographic work.

**LEVELLING.**—In the simple form levelling is carried out by means of the Y dumpy level, which is merely a telescope with cross-wire in its focal plane, capable of movement in a horizontal plane which is determined by means of a sensitive spirit-level usually mounted over the telescope. Any object seen on the cross-wires is thus at the same level with them. The levelling staff, a rectangular staff, is used in conjunction with the level; it is marked in feet, tenths, and hundredths from the bottom upwards, and there are several patterns of marking, each aiming at special clarity. The telescopic form in

<i>Back-sight</i>	<i>Fore-sight</i>	<i>Rise</i>	<i>Fall</i>	<i>Reduced Levels</i>	<i>Remarks</i>
4 10				20 00	Below at A
5 30	10 15		6 05	13 95	At B
3 50	8 19		2 89	11 06	" C
7 18	0 17	3 33		14 39	" D
0 10	0 30	6 88		21 27	" E
	6 15		5 75	15 52	" F
20 48	21 96	10 21	14 69	20 00	
	20 48		10 21	15 52	
	4 18		1 18	4 48	

FIG. 6. RECORDING OF READINGS IN LEVEL BOOK

three sections is generally used. Simple levelling is carried out by arranging the telescope in a conveniently central situation for sighting two positions of such staff (or of the first and second staves

position, and so on. It is to be noted that these observations are independent of the height of the telescope cross-wires above the ground.

The above table (Fig. 6) shows the method of recording the readings in the level book. A datum level of 20 ft. below the first reading has been assumed. The method of finding what is known as the 'reduced level' at each successive point, and the checking at each stage of the record, will be obvious.

Where natural objects are observed as a base from which to commence levelling, a level mark, of crow's foot form, is cut, or a bench mark on an ordnance map may be used as a starting point. In practice circumstances will generally arise when several intermediate levels between the back-sight and fore-sight can be taken at each setting of the levelling instrument, an additional column for intermediate sights, between the back-sight and fore-sight columns, being accordingly provided in the level book. Fig. 7 shows, in plan, a typical set of such levels, taken from the first setting of the instrument at station A', to be followed by a corresponding set at station B' (not shown in fig.), and so on.

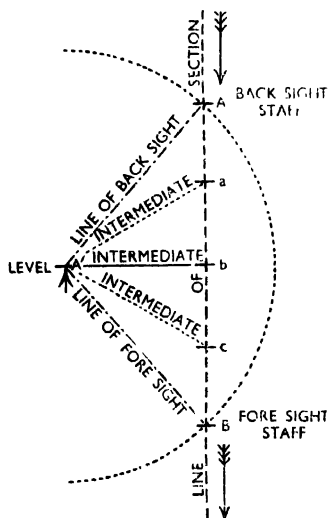


FIG. 7. INTERMEDIATE LEVELS

if two are employed), the 'back-sight,' i.e. the reading on the first staff just passed, is recorded, and then the telescope is turned as necessary for reading the 'fore-sight,' i.e. the reading on the next advanced position of the staff (or the second staff). The difference in the readings gives the difference in level of the ground at the foot of the two staff positions. Without moving the staff from its new advanced position the levelling instrument is carried bodily forward, duly adjusted, and a back-sight taken on this staff; while a new fore-sight is taken on the staff (or on the second staff) in its next new forward

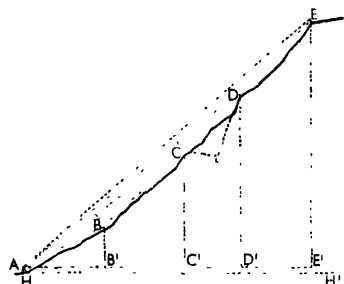


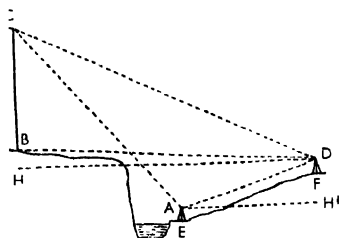
FIG. 8. VERTICAL SECTION OF TRANSVERSE LEVELS

Fig. 8 shows a vertical section line of transverse levels carried up a hill-side across a longitudinal main line. A theodolite measures the general angle of slope

from station A to station E, and staff readings are taken at points B, C, D, and E, and their horizontal distance apart measured with a tape or chain. The reduced levels of these points in relation to the horizontal datum B<sup>1</sup>, C<sup>1</sup>, D<sup>1</sup>, and E<sup>1</sup> can then be computed.

**Precise levelling** is a very accurate system of levelling carried along lines which may be upwards of 1000 m. long, in geodetic S. or for the execution of special large-scale engineering projects. Specially constructed instruments are employed, and special precautions are adopted in making the observations, which are too complicated for the general reader to be described here. A probable error of  $\pm 1$  millimetre per kilometre was achieved in the U.S. coast and geodetic line of precise levels from Sandy Hook to St. Louis (1109 m.).

Contouring delineates on a plan a series of lines of equal altitude, or lines of intersection of a hill by horizontal planes. The vertical intervals are obtained by levelling or by angular measurement. The contour lines may be obtained by levelling along other sections normal to the contours when plotted, or at each level on the original section the contours may be worked round by staff and level, the former being moved up and down the slope till the desired level is obtained. A peg is driven in here and the process continued. Setting out curves is a form of work often required. For this the theodolite is chiefly used. The radius of curvature having been determined, a point may be taken in the line from which the curve springs. Back- and fore-sights having been taken, the angle of the theodolite is set to give the chord, the length of which would be 1 chain. This is found by calculation or taken from tables. Two theodolites are often used, and the curve set out from opposite ends.



MEASUREMENT OF HEIGHT FROM AN AWKWARDLY PLACED BASE.

**Heights.**—Fig. 9 illustrates the method of obtaining height BC by means of a theodolite, where a base AD is awkwardly placed, the foot of the object being invisible from A. For the method of solving the triangles see **TRIGONOMETRY**. In this case angles CDB, CDH are observed from D, and the height of instrument DF above

the peg measured. From E the angles CAD, DAH<sup>1</sup> are observed. Thus  $CDH + HDA = CDA$ . In the triangle ACD,  $180^\circ - (A + D) = C$  and  $\sin c : c :: \sin D : d$ . In the right-angled triangle CHD,  $90^\circ - D = C$ . In the triangle CBD,  $180^\circ - (C + D) = B$  and  $\sin B : b :: \sin D : d$  and  $d = CB$ .

**TOPOGRAPHIC SURVEYING.**—A simple land survey as a rule gives no reference to the exact position on a map of the country, nor is it concerned with anything beyond relative level. A topographic survey, on the other hand, must commence with astronomical observations of lat., long., and azimuth, as well as a determination of level relative to mean sea level. The last is taken by observation of tide-gauges over an extended time, and can be carried inland by the ordinary process of levelling. Before determining the base-line stations, it is usual to carry out a plane-table reconnaissance, during which many unforeseen troubles are discovered and avoided with the later theodolite operations. At the same time station points are determined and beacons erected, or suitable objects chosen as beacons. Any form will serve so long as it gives a suitable image for reading with the cross-wires of the theodolite, but ease of centring is important; i.e. the point vertically below the mark on the beacon must be easily and correctly determinable. On this point the station mark must be placed in such form and in such manner as to be permanent. The reconnaissance completed, a careful scheme of triangulation will have been determined; the base line is then measured by tapes with accuracy, and the theodolite takes the place of the plane table, all attention being now given to accuracy of angular measurement. In place of the vernier it is usual now to read the scale by means of a micrometer microscope (see **TRANSIT INSTRUMENT**), accuracy being increased five-fold.

**Observation of Latitude.**—This may be made at any point in the triangulation, and except for geodetic purposes it is not usual to fix more than one station astronomically. Any method may be adopted (see **LATITUDE AND LONGITUDE**), but the usual one is by observation of a star's altitude when near the meridian; this is repeated for two or three nights and with different stars, both N. and S., and accuracy should be obtained to one or two seconds of arc.

**Observation of Longitude.**—Local time is obtained by observation of pairs of stars E. and W. as near the prime vertical as possible. Greenwich time may be obtained from the mean of sev. chronometers, or by telephone or radio.

**Observation of Azimuth.**—This, the true bearing, or angle between the prime vertical and meridian with respect to the line chosen for determination, is obtained by observations of a circumpolar star or one near the prime vertical, and the beacon illuminated by a small light such as a bull's-eye lantern; it is often more convenient to take the observation with respect to some other point than the beacon, and to obtain the bearing of

the beacon with respect to this latter; the point is placed about a mile away. The true azimuth of the stars, and the difference between them and that of the station, afford a means of determining the true azimuth of the station, an accuracy of two or three seconds of arc being obtainable.

**Theodolite Triangulation.**—From any station a round of angles is taken between A and B, B and C, and so on to G and A, so that A is observed twice: by this means a check is placed on the angles, as their sum should be  $360^\circ$ . As a further check the round is taken sev. times. If this cannot be done directly, owing to weather, for instance, it is done indirectly by erecting some reference mark easily visible. The measured base is 'reduced to sea level,' since maps are projected on to one plane, so that the remainder of the triangulation obtained by angles is automatically reduced to the same level. Modern base-measurement being a comparatively easy process, the results of theodolite triangulation are fairly often checked by chaining. In small triangles, with sides of 1 or 2 m., the sphericity of the earth is negligible; in larger triangles this is shown on the readings, the three angles being more than  $180^\circ$  in sum. This spherical excess, depending on the area of the triangle, is easily calculated and forms another check. When subtracted from the sum, the difference between the result and  $180^\circ$  is known as the triangular error, and may be as much as two or three seconds in good topographical work. Spherical excess is given by the formula  $E = ab \sin C \operatorname{cosec} 1'' 2^2$ , but simplified formulæ are used for most purposes. One of the greatest difficulties is in connection with refraction; as this usually is supposed to act in a vertical plane it does not generally affect the horizontal angles, except with 'grazing rays,' which should be avoided. These are lines of sight passing close to steep slopes, where there is usually a horizontal temp. gradient. Vertical refraction in a horizontal ray is impossible to calculate; it may be avoided largely by observing in the early afternoons when it is a minimum, and by back-sighting, which eliminates it, if the conditions of the two observations are the same. Otherwise it must be corrected by calculation or reference to tables, a partial remedy only. The surveyor, when experienced, will determine it by experience, aided by a careful analysis of his readings from all other points. Over a ray of 30 m. the error may be 2 or 3 ft. with back-sight; it is more when one observation only is relied on, and very uncertain indeed in mountainous regions, or over water, sand, or snow. It may, however, be noted that a vertical angle taken from the level has only one reading error, whereas a horizontal angle has two. A great deal may be done in checking errors by the careful selection of the second and following chained lines. In more accurate topographic survey the system of triangulation is worked up into sequences of quadrilaterals, equivalent to tying the triangles, which gives regular checks. Geographical

position of stations may, in less extended surveys, be obtained graphically by carefully plotting the base, astronomically determined, on a plane-table graticule, or sheet with the lat. and long. arcs constructed according to the methods of map projection; if the corrected angles are plotted on the graticule, the stations will fall in their true geographical positions. In more extended work this is done by calculation, the computation having been greatly simplified in the tables of the survey of India. Levelling with the theodolite follows the same principles as for simple survey, with the addition of the important original linking up to mean sea level.

**ORDNANCE SURVEYS.**—The prin. triangulation of the United Kingdom occupied the first half of the nineteenth century. The base was laid out on Salisbury Plain and measured with steel, glass, and wooden rods, and triangulation was proceeded with over the whole country. Instead of using the modern method of chains of triangles along meridians and parallels, the country was arbitrarily divided into convenient triangles of about 5 in.-side. Connection was estab. between Wales and Ireland by the lime-light; N. of Scotland the two is. Fair and Foulca made it possible to extend to the Shetlands. No base was measured in Scotland, but another was laid out by Lough Foyle, compensating bars being used. The triangles were broken up into smaller ones averaging a little over a mile a side, and these were all chained over, even the contouring being done by chain. These contours, although accurate, are too far apart. The trigonometrical survey occupied about sixty years. The datum level was mean tide level at Liverpool, but a more scientific datum was obtained off Cornwall and in the North Sea. A base has since been measured at Lossiemouth in Scotland, and previous data were checked from it (*see also* ORDNANCE SURVEY; MAPS (MAPS OF THE ORDNANCE SURVEY)). In India survey has been of the highest standard, and has contributed enormously to the advance of geodesy. Australia and Canada are carrying out a complete geodetic survey. In S. Africa the geodetic survey is complete; the topographic survey is well advanced. Tropical Africa has been partially surveyed under the control of the Colonial Survey Committee (1905); this body has extended its work to other colonies and dependencies. Boundary surveys are largely completed in Africa, having been delineated chiefly for international political purposes. The Alaska boundary, and that between Chili and Argentina, are instances of extremely careful work.

**ROUTE TRAVERSING** has become an important branch of surveying, since it is often carried out with great labour, patience, and skill. It consists in careful observations of the route taken by an explorer, whereby his journey may be accurately laid down, and in the plotting of as much of the lateral feature as he is able to observe while travelling. The



work of Dr. Sven Hedin in Tibet is a model of this type of work. In the past much error has crept into maps, notably in Africa, owing to faulty instruments and inaccurate observations of the astronomical data for selected stations *en route*. The improvements in instruments and the encouragement by the Royal Geographical Society (*q.v.*) have led to much more accurate work. The explorer nowadays checks his route by astronomical observations as in topographic survey and usually carries sev. chronometers. Between stations he keeps a sort of dead reckoning. Distance may be measured by cyclometer or perambulator, a wheel of known circumference, often 10 ft., mounted in a fork and handles, and fitted with counting mechanism to give the number of turns; the sledge-meter used in Antarctic expeditions is a form of this. A bicycle may be so arranged. Distances measured this way have to be corrected for windings of the path and for inequalities of level up and down hills, etc. The experienced explorer usually relies on his own experience, together with the time taken to traverse the distance; he knows pretty accurately his own marching pace, the pace of his animals, of his party or of his vehicles. His chief difficulty lies in estimating rate up hills and down, particularly on slight, almost imperceptible gradients. Windings of the path, nature of surface, weather, etc., are all sources of error. His traverse, or connected series of straight lines, has to be watched in its various bearings, which is usually done by means of a prismatic compass. Fixing on a distant objective, he takes its bearing, and on reaching it repeats the process for another objective. This again is very difficult in hilly and forest land, particularly the latter. A portable theodolite is often carried and enables him to check his result to some extent two or three times in an extended journey. When he crosses the route of a previous explorer he may check by that, if, as is usual, he has previously obtained the records. Meanwhile he takes the bearings of distant and near landmarks from sev. points along his route, such cross-bearings forming another check on his traverse. He keeps a field book in which all these are entered, together with details of things he wishes to remember on either side of his track, *e.g.* forest, cultivation, swamp, etc. The most prominent distant features he will observe with the theodolite with greater accuracy. His astronomical bearings may be obtained within a mile by sextant, much closer by the theodolite for latitude. For longitudes his chief difficulty is Greenwich time, necessitating the carrying of sev. chronometers; in any case, however much care is taken, the rough journey, the joltings, and carelessness of native bearers may render them all unreliable. The errors of these may be checked, but with difficulty and laborious calculation, by observations of occultations of stars by the moon; the infrequency of these is a difficulty. With the sextant he may measure lunar distance, the distance between a star and the moon, but with

less accurate results. His compass bearings are not true bearings, since the needle varies in deviation from place to place and time to time; these must be checked by observations of azimuth, the difference between which and the compass bearing gives the deviation. It necessitates a knowledge of approximate latitude, the horizontal angles of the sun and a distant object, and the altitude of the sun. The true azimuth of the sun is known from its altitude and the latitude, and by applying to this the horizontal angle of the object its azimuth is determined. However careful and skilful the traveller may be, his route traverse is never accurate enough for correct maps. The process of levelling reduces itself to rougher methods than those of true surveying. The aneroid barometer is a usual means, but as it is affected by temp. and other weather conditions, as well as by height above sea level, only a very rough approximation can be made. If one be taken to the height required and another be kept in camp, simultaneous series of readings will give a better result. In parts of the world where variations are practically quite regular, the results of single observations may be relied on, *e.g.* S. Nigeria. The hypsometer, or boiling-point thermometer, is an instrument much used and gives somewhat less accurate results than the aneroid. The heights of mts. by these methods are given by various travellers with differences of sev. hundred feet.

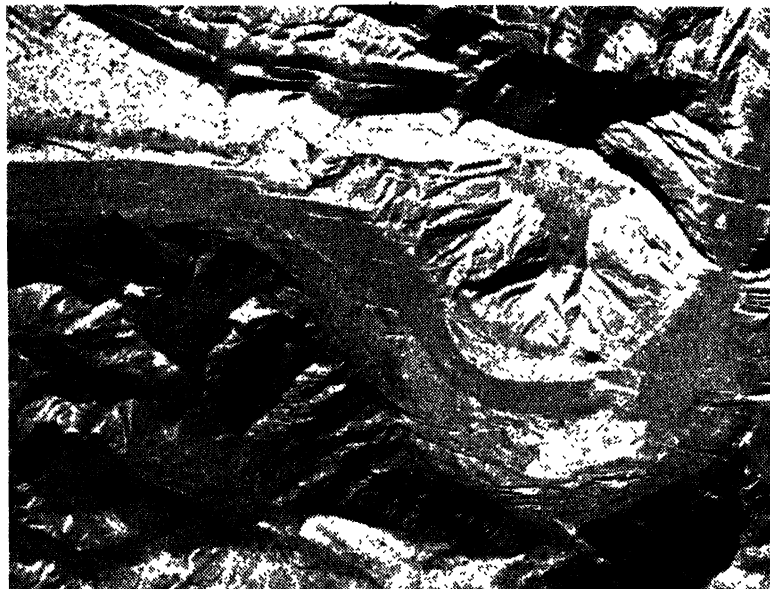
*Geodesy (q.v.)* has for its aim the measurement of the earth considered as a nearly spherical body.

**TACHEOMETRY.**—In country difficult for ordinary traversing the tachometer may be used for the method of subtense measurement. At one end of the ray to be measured two poles about 50 yds. apart are placed at right angles to the ray, their distance apart being accurately measured. These are observed through the theodolite and the angle subtended measured; representing the angle by  $2\theta$ , the distance between the poles by  $2s$ , then the length of the ray  $= s \tan \theta$ . Another method for shorter rays is to use a theodolite with two wires at fixed distances apart on the field, and observe, along the ray, a graduated staff. The wires always give a fixed angle which will enclose more or fewer graduations on the staff, the further or the nearer it is respectively. The stadia marks, as the wires are called, are so arranged that the graduations have only to be multiplied by a factor to give the distance of the staff from the observer. This factor varies with the distance of the wires from the optical centre of the objective of the telescope which is changed in altering the focus for different distances. The correction for this is small and variable, but is made by adding to the computed distance the distance from the centre of motion of the instrument to a point on the axis, beyond the objective, at a distance equal to the focal length from the optical centre. The tachometer is an instrument which, by the introduction of a third lens in the telescope, the anallatic lens, eliminates the

correction and gives the reading at once. The instrument is useful for small surveys and military work, but not for extended surveys. When used on the slope, if the graduated bar is horizontal, the computed distance must be multiplied by the cosine of the slope to give the horizontal distance; if vertical the multiplier is the square of the cosine.

NAUTICAL SURVEYING carried out by ships along the coast depends on the same methods of observation and triangulation. In coast-lining a shore party carries out

These are found by ordinary sounding operations carried out by a boat directed from the shore. When the water is of sufficiently small extent, a cable may be stretched across and the sounding carried out from the shore by means of a sounding line attached to the cable. The methods of determining the position of the boat from the shore are numerous, but there are different ways of selecting rays parallel and intersecting. In the case of a lake, it is merely the process of contouring by means of sounding. Such a survey often



AERIAL SURVEY FOR TOPOGRAPHICAL MAPPING

From this photograph was produced the map shown opposite, both reproduced by permission of Hunting Aerosurveys Ltd

the usual methods in conjunction with the ship. Beacons are so placed that their bearings can be taken from the ship which makes a traverse along the coast. In more accurate coast-lining the whole of the work is done on shore, except for the determination of inshore depths, particularly the high-water line, which is often done from boats at anchor. Where stations are required in water special methods are naturally also required, and it is in these methods of carrying out the work at sea that nautical surveying differs.

*Hydrographic Surveying* deals more particularly with the area and depths of water stretches, at sea, a lake or riv. It includes the linking up with the shore triangulation, the mapping of the margin, but particularly the sounding of depths.

includes temp. observations, salinity, velocity, current, tides or seiches, transparency, etc.

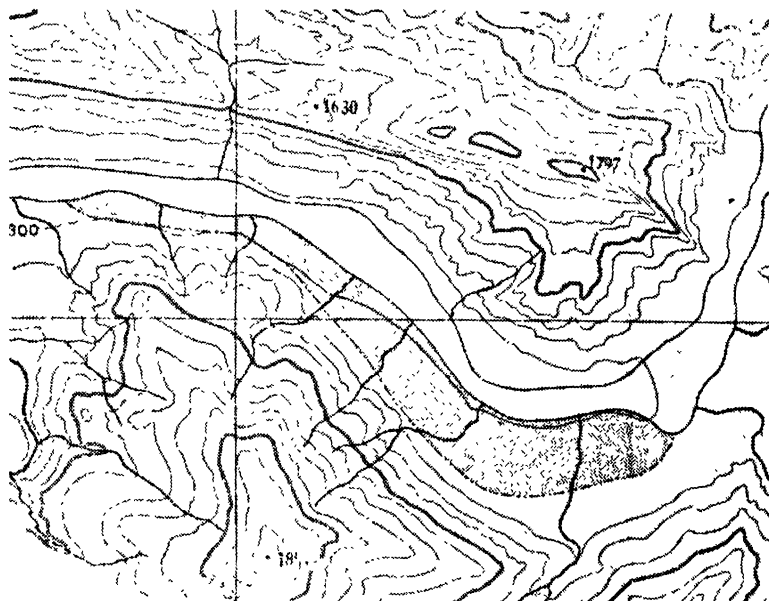
MINE SURVEYING is another branch with its special methods. The linking up with surface survey is important; the first point is the fixing of the position of the upper and lower ends of a weighted wire let down the shafts, when a traverse from one to the other will give the basis for a complete survey and connect the underground with the surface. If one shaft only is available two wires may be suspended, thus giving short base lines above and below ground, the relative positions of which are known. Underground there is the necessity for special illuminations, and there is more use of magnetic bearings. Stations are usually marked in the roof, and pendulums sus-

pended for centering, the telescope being marked on the top. When a mine is entered by tunnel or sloping shaft, the surface survey can be carried down without trouble. The mine surveyor is naturally always extending, and his observations must include all that are necessary for following the beds of coal correctly.

**PHOTOGRAPHIC SURVEYING.**—In this method, first suggested by Aimé Laussedat, the positions of sev. stations are fixed by trigonometrical survey, and the sights

making, particularly in difficult country, for the mapping of cities, and for archaeological work, where its aid has been invaluable. Cameras for aerial photography are usually fitted with lenses of very long focus illuminating a field much larger than the plate; and protection against excessive light necessitates sev. partitions inside the camera, each with an aperture permitting only the useful rays to pass (*see also* next section).

**AERIAL SURVEYING.**—The first air photographs were taken from captive



AERIAL SURVEY FOR TOPOGRAPHICAL MAPPING

Map produced from the photograph shown opposite Scale 1 : 10,560, with contours at 50 ft. vertical intervals

usually taken on the plane table are photographed, and plotting from these is performed in the office later. The process of plotting is very complex, the method has, however, been extensively used in gov. surveys in Canada (*see* PHOTOGRAMMETRY).

**Aerial Photography** is a recent and important development. It came into notice during the First World War, when it provided vital reconnaissance information. The use of specially sensitised plates and light-filters enabled photographic evidence to be obtained when flying too high for visual observation to be effective, and the comparison of day-by-day records of the same area showed any movements made by the enemy. Photography was also far more efficient than visual observation in detecting camouflage. Aerial photography is now used for surveying and map

balloons, by Aimé Laussedat in 1858. Not until the coming of the aeroplane, however, and the many advances made as a result of the First World War did air survey begin to play an important part in cartography. Great developments took place between the wars. In Europe, especially in Switzerland and Germany, research was largely concentrated upon producing elaborate three-dimensional plotting apparatus designed to reconstruct the geometrical conditions at the moment of exposure, thus compensating for random errors of tilt in the photography. In England and in India more attention was paid to the simpler graphical methods of plotting. In the Second World War air photographs became of primary importance. Many inventions resulted, including thermostatically controlled cameras,

automatic pilots, camera stabilising controls, and the use of radar and radio aids to fix the position of the aircraft. Examples of aerial surveying are the photographing of 125,000 sq. m. of the timber area of Ontario to produce maps with a 1:15,000 scale, and of 5000 sq. m. in Colombia for exploration of oil resources. Two types of photograph are used in aerial survey, viz.: 'obliques,' taken with the camera depressed below the horizon, and 'verticals,' taken vertically downwards. The former is a perspective picture which shows natural features such as hills, ravines, etc., whilst the latter shows the ground as a plan and clearly defines local features such as marsh, cultivated lands, details of tns., tracks, etc. The verticals are most commonly used, producing a series of parallel strips overlapping laterally by 30 per cent. The shutter speed of the camera is regulated so that successive exposures overlap in the direction of flight by 60 per cent. Thus every object on the ground will appear on the exposures taken from three different air positions, thus reducing to a minimum the risk of gaps by inaccurate flying.

There are difficulties which arise in the taking and using of aerial photographs for survey purposes. The plane of the photographic plate should, to obtain a true perspective plan, be parallel with the ground surface; this rarely happens, and the angle between these two planes, called 'tilt,' has to be allowed for because it causes differences of scale. Again, the reflected light-rays from the photographed subject converge in a cone having its apex at the lens of the camera, therefore the higher a point such as a church steeple is, the further away from the centre of the photograph its image will appear, thus introducing distortion in the perspective view. The scale may be determined by comparing the distance between two points on the photograph with the distance on the map or actually measured off on the ground between the same two objects. The utilisation of aerial photographs for producing maps and plans is described under STEREOGRAPHOMETRY.

See J. A. Flemer, *Photographic Methods and Instruments*, 1906; G. W. Usill, *Practical Surveying*, 1908; W. F. Stanley, *Surveying and Levelling Instruments*, 1914; A. L. Higgins, *Elementary Surveying*, 1943; and *Higher Surveying*, 1944; D. Clark, *Plane and Geodetic Surveying*, 1944-46; S. W. Perrott, *Surveying for Young Engineers*, 1946; and W. N. Thomas, *Surveying*, 1948.

**Surveyors to Lloyd's Register, see under LLOYD'S REGISTER OF SHIPPING.**

**Surya**, in Hindu mythology, the sun. He is represented as the son of Dyaus and the husband of Ushas the Dawn, and he moves in a car drawn by fiery horses. He is the preserver of all things stationary and moving, the source of life, and beholds the good and bad deeds of mortals.

**Surya Siddhanta**, famous astronomical work in Sanskrit, said to be a direct revelation from the sun. It consists of short aphorisms which form a set of rules

to calculate the positions of the heavenly bodies. It is sometimes identified with the Saura Siddhanta, one of the five earlier works on which the Panchasiddhantika was founded, a work by Varahamihira, who flourished about the beginning of the sixth century.

**Sus**, or **Sous**, riv. of Morocco, rising in the Atlas Mts., and flowing W.N.W. to the Atlantic.

**Susa**: 1. Or **Shushan**, anct. city of Persia, on the E. bank of the Choaspes, now in ruins, believed to have been founded by Darius I. It is mentioned in the O.T. (Daniel), and on its site numerous inscribed stones have been discovered. 2. Fort. in Italy, in Piedmont, 30 m. W.N.W. of Turin. It has a ruined castle and a triumphal arch erected in honour of Augustus. There is also a cathedral dating from the eleventh century. It was the departure point for the old passes over the Mont Cenis and Mont Genève, and was once the cap. of Piedmont. There are textile industries. Pop. 7000. 3. Or **Sousse**, port of Tunisia, cap. of a prov., on the gulf of Hammamet. There was a Rom. harbour, and there are catacombs near by. Phosphates, olive oil, and esparto grass are exported. Pop. 28,500.

**Susaic**, see under FLEMER.

**Susanna**, *History of*, book of the Apocrypha belonging to the group of additions to the Book of Daniel in two Gk. versions of the O.T. The story of the virtuous Susanna (a favourite theme of painters and sculptors) contains at least two folklore motifs, of the woman falsely accused and the clever young judge. The story was pagan in origin and had no didactic purpose at first. When the Jews adopted it they identified the youth with Daniel and changed all the other characters into Jews living in Babylonia during the exile, and the whole story became an edifying account of God's vindication of the innocent and of His punishment of the wicked. The probable place of origin of this book is Judea (if the original language was Heb. or Aramaic) or Alexandria (if it was written, as appears more probable, in Gk.); the probable date is 150-100 B.C.

**Susiana**, see KHUZISTAN.

**Suspension Bridges**, see BRIDGE.

**Susquehanna**, riv. of Pennsylvania, U.S.A., the main branch of which rises in Otsego Lake, and has a length of 200 m. The other branch rises in the Allegheny Mts., and after a circuitous course of 200 m. joins the main or E. branch at Sudbury, Pennsylvania. The united stream flows S. and S.E. past Harrisburg and Columbia, and enters Chesapeake Bay at Havre de Grâce.

**Sussex**, maritime co. on the S. coast of England, fronting the Eng. Channel for 90 m., and bounded N. by Surrey, E. by Kent, and W. by Hampshire. It is 74 m. from E. to W., and about 28 m. in its broadest part. Area 908,985 ac. Pop. 635,300 (excluding co. hors.). Its coastline is unbroken by bays of any extent, but the promontory of Beachy Head, the termination of the S. Downs, juts out into the Channel. In the W. is the low

promontory of Selsey Bill. From Hampshire to Beachy Head, the S. Downs are generally within 5 to 10 m. of the sea, and with occasional heights of over 800 ft., Ditchling Beacon, off the Brighton road, being 813 ft. The co. is watered by the Ouse, Arun, Rother, and Adur. There are no large rivs., but the co. owes much to the many little streams that feed its few short rivs. The Rother, with its source in the region of Ashdown Forest, flows mainly E., forms a boundary with Kent for some distance, and with the Brede, reaches the sea at Rye. The Ouse from near Horsham, past Lewes to the sea at Newhaven, flows S.E. for most of its brief course. The Adur collects numerous little streams around W. Grinstead, and reaches the sea only 1.5 m. away at Shoreham. The Arun, from Surrey, flows S. with innumerable bends, by Pulborough, Amberley, and Arundel to the sea at Littlehampton. Other streams are the Lavant, Chilt. Stor. Cuckmore, etc. Sussex is noted for its seaside resorts, the prin being Brighton, Hastings, Eastbourne, Worthing, Shoreham, Littlehampton, Bognor Regis, Bexhill, St. Leonards, and Seaford. The middle of the co. is occupied by the weald, which was formerly the Anderida Forest, now an undulating and fertile tract. There is still much woodland, of which Ashdown Forest is the principle part of the auct. forest. On the downs, which cross the southern part of the co. from W. to E., large flocks of sheep are grazed, the Southdown breed being famous. Poultry farming and market gardening are important industries. The crops consist chiefly of wheat, oats, and turnips; fruit is extensively cultivated, and there are hop gardens in the E. The Sussex iron industry, once flourishing in the Weald, was of national importance in the sixteenth and seventeenth centuries. Fishing is engaged in along the coast; with the exception of Chichester, the harbours are not good, but Newhaven is a cross-channel port. Sussex contains the Cinque Ports Hastings, Winchelsea, and Rye. In the E. are the Romney Marshes; here, by the action of the sea, sev. tns. which were formerly ports, e.g. Rye and Winchelsea, are now inland tns. The co. returns six members to the House of Commons. At Goodwood, Lewes, and Brighton are well-known race-courses. The antiquities of Sussex are numerous and include the castles of Hastings, Arundel, Lewes, Bramber, Hurstmonceaux, Pevensey, Bodiam (a National Trust property), etc., the abbeys of Battle, Bayham, etc., Chichester Cathedral, which was founded in the eleventh century. There are very many prehistoric camps, earthworks, and burial mounds; S. has been called the finest open-air museum of antiquity. There are notable Rom. remains. The chief historical events are the landing of the S. Saxons (in 447), the battle of Hastings or Senlac (1066), and the battle of Lewes (1264), while the co. was also the scene of the exploits of Jack Cade in 1450. From the Sackvilles of Buckhurst to Rudyard Kipling (Rottingdean), there

is a wealth of literary associations. See M. A. Lower, *History of Sussex*, 1870; W. H. Hudson, *Nature in Downland*, 1923; C. G. Harper and J. C. Kershaw, *The Downs and the Sea: Wild Life and Scenery in Surrey, Sussex, and Kent*, 1923; Hilaire Belloc, *Hills and the Sea*, 1927, and *The County of Sussex*, 1936; E. C. Curwen, *Archæology of Sussex*, 1937; A. Meo, *Sussex*, 1942; and R. F. Jessup, *Little Guide to Sussex*, 1949 ed.

**Sussex Breed**, see under CATTLE.

**Sussex Regiment**, Royal, formerly the 35th and 107th Regiments. The 35th was raised in 1701 at Belfast, and served in the defence of Gibraltar, 1704. It had a distinguished career in N. America and the W. Indies, and at Quebec under Wolfe gained its badge of the Rousillon plume, having defeated the Fr. Royal Regiment of Rousillon. It was in the Amer. War of Independence and the Indian mutiny. The 107th was raised in 1851 in India as the 3rd Bengal European Regiment. This regiment was employed in various parts of Bengal during the Indian mutiny. In 1861 it transferred as the 107th. In 1881 the two regiments were linked to form the present regiment. During the First World War twenty-three battalions were raised, which served in France, Flanders, Italy, Gallipoli, Egypt, Palestine, N.W. Frontier of India, and N. Russia. The regiment fought in France, E. Africa, and Burma in the Second World War. Units were part of the famous 4th Indian Div. which played a leading part at Sidi Barrani in the first great victory won by the Brit. Army in the war.

**Sussex Spaniel**, see under SPANIEL.

**Sustentation Fund**, see FREE CHURCH OF SCOTLAND.

**Susterman, Lamprecht**, see LOMBARD, LAMBERT.

**Susz** (Ger. *Rosenberg*), tn. of Silesia, Poland, 5.5 m. N. of Racibórz (Ratibor). Pop. 5800.

**Sutcliffe, Herbert** (b. 1894), Eng. cricketer, b. at Summerbridge, Yorkshire. First played for Yorkshire in 1919, and quickly estab. himself as an opening batsman. S. scored over a thousand runs in each of his twenty-one seasons and represented England on thirty-four occasions. During his career he scored 50,135 runs, with a highest score of 313, when with Holmes he estab. a new world record first-wicket partnership of 555 for Yorkshire v. Essex in 1932. His autobiography *For England and Yorkshire* was pub. in 1935 (new ed. 1948).

**Sutherland, Carol Humphrey Vivian** (b. 1898), Eng. historian and numismatist, graduated from Christ Church, Oxford. He became assistant-keeper of coins in the Ashmolean Museum, Oxford, and from 1948 president of the Royal Numismatic Society. His pubs. include *Coinage and Currency in Roman Britain* (1937); with H. Mattingly and E. A. Sodenham, the later vols. of *Roman Imperial Coinage* (1939 onwards); with J. G. Milne and J. D. A. Thompson, *Coin Collecting* (1949).

**Sutherland, Graham Vivian** (b. 1903), Eng. painter, b. in London. He was educated at Epsom College, and after a

year as engineering apprentice in the Midland Railway works at Derby went to Goldsmith's School of Art at New Cross. Basically a romantic artist, his dramatic and turbulent landscapes, studies of inanimate objects, his fine series of war paintings of devastation and heavy industry, and his later more composed water-colours have brought him considerable prominence in the field of modern art.

**Sutherland**, maritime co. of N. Scotland, bounded on the N. by the Atlantic, W. by the Minch, E. by Caithness, and S. by Ross and Cromarty. It forms a rough oblong about 62 m. long by 49 m. broad, with an area of 2028 sq. m., and a pop. (1948) of 14,000. The surface is mountainous in the N. and W., the chief summits being Benmore Assynt (3274 ft.), Conievel (3234 ft.), Ben Clibrick (3154 ft.), with sev. others approaching 3000 ft. In the E. the chief heights are the Hill of Ord (1320 ft.), and Cnoc an Eircannaich (1698 ft.). The S. and S.E. of the co. is fairly level. The coast is rocky and deeply cleft by sea lochs, with bold headlands, such as Cape Wrath and Strathly Point on the N. coast. The most important inland lochs are those of Shin and Assynt, but there are over 300 smaller ones. The prin. rivs. are the Oykell with its tribs., the Shin and Cussley, the Helmsdale, Brora, and Fleet flowing S.E.; the Donard, Naver, and Halladale flowing N.; and the Inver and Luxford flowing W. The interior of the co. is covered with 'deer forests', trackless wastes, destitute of trees, or mt. moorland, abounding with roe deer. The most fertile as well as the most populous dist. is in the valley of Dornoch Firth, where the land is highly cultivated. Dornoch (pop. 725), the co. tn. and royal burgh, with a cathedral dating from 1223, is a holiday resort noted for its golf links. Brora is the commercial centre. Agriculture, mostly crofting and sheep farming is the prin. industry producing Cheviot sheep in large numbers, cattle, and oat and barley crops. Other industries are tweed manuf. at Brora and Rogart; brick making at Brora and Lairg; whisky distilling; herring and salmon fishing; hotel keeping, and catering for a large tourist trade. There is a small coal-pit at Brora. The co., with Caithness, returns one member to the House of Commons.

The co. is notable for the number of its prehistoric monuments. Sutherland was overrun by the Scandinavians at the beginning of the eleventh century, who continued their depredations in the twelfth century. During 1810-20 the first duke of Sutherland drove 15,000 crofters, who occupied the interior of the co., and were eking out a precarious existence, to the coasts and valleys, causing them to endure terrible hardships on the inhospitable land, and brought in flocks of sheep. This act was called the 'Sutherland clearances.' Dunrobin Castle, near Golspie, is the seat of the duke. Owing to difficulties of access and lack of roads, Sutherland remained in an extremely backward condition until recent years. Rail-

ways now serve the S.E. part of the co. and cover the E. coast from the S. shore of Dornoch Firth, running along the E. coast of Sutherland and then N. parallel to the Caithness border, turning about half-way due E. into Caithness. See H. F. Campbell, *Caithness and Sutherland*, 1920; J. Gray, *Sutherland and Caithness in Saga-time*, 1922; C. D. Bentinck, *Dornoch Cathedral and Parish*, 1926; F. T. Smith, *Sutherland: Land Utilisation Survey*, 1941; and D. Macdonald and A. Polson, *The Book of Ross, Sutherland, and Caithness*, 1948.

**Sutlej**, riv. of India and Pakistan, in the Punjab, rises in W. Tibet, near Lake Manasarowa at an altitude of 15,000 ft. above sea level. It flows through the Punjab from E. to S.W., receiving in its course the waters of the Chenab and the Beas, until it reaches the Indus near Mithankot, on the N.W. frontier of Rajputana. Its waters are much used for irrigation. Length 900 m.

**Sutro, Alfred** (1863-1933), Eng. dramatist; also the translator of sev. works by Maeterlinck. Educated at the City of London School and in Brussels. S. turned to writing plays after a successful career in business, and was the author of about thirty plays on social themes, including *The Walls of Jericho* (a comedy of modern society, 1904); *The Perfect Lover* (1905); *John Gayde's Honour* (1907); *The Marriage will not take place* (1918); *Uncle Anghow* (1919); *The Laughing Lady* (1922); *Far Above Rubies* (1924); *The Desperate Lovers* (1927). During the First World War he served with Army Intelligence and was awarded the O.B.E. in 1918. His autobiography, *Celebrities and Simple Souls*, was pub. in 1933.

**Suttee**, see SATI.

**Sutton, Sir Richard**, see BRASENOR COLLEGE.

**Sutton and Cheam**, bor. of Surrey, England, 4 m. W. of Croydon. The High Street is a picturesque part of the main road to Reigate, where it ascends the downs. It is a London dormitory suburb. Pop. 81,000.

**Sutton Bridge**, urb. dist. and riv. port of Lincolnshire, England, on the Nen R. near the Wash, 7 m. N. of Wisbech. It is in a potato-growing dist. and trades in corn and timber. Near by is the vil. of Long Sutton, noted for its old and beautiful church. Pop. 3000.

**Sutton Coldfield**, municipal bor. of Warwickshire, England, 7 m. N.E. of Birmingham, and a residential tn., is notable for a sixteenth-century housing scheme which was carried out by John Vesey (alias Harman), a native of the tn. who was appointed bishop of Exeter in 1519. Hardware is manufactured. A television station to serve the Midlands was opened at S. C. in Dec. 1949. Pop. 39,900.

**Sutton-in-Ashfield**, urb. dist. and manufacturing tn. of Nottinghamshire, England, 14 m. from Nottingham. The church of St. Mary Magdalene was built in the twelfth century and restored in the nineteenth. It has collieries, manufs. of cotton, hosiery, thread, light engineering,

plastics, tin boxes, cardboard boxes, and precision tools. Pop. 39,800.

**Sutura** (*sutura*, a seam), term applied (1) to a form of articulation met with only in the skull, where union is accomplished by fibrous tissue continuous with the periosteum; (2) to a stitch or stitches closing the contiguous margins of a wound; (3) to the material (catgut, nylon, silk, etc.) used for closing the wound. Cranial S. are divided into true and false. The former, known as *sutura vera*, are those whose articulating surfaces are connected by a series of projections and notches dovetailed together. The margins of the bones are not in direct contact, however, but are separated by a membrane which is a continuation, externally of the pericranium and internally of the dura mater. False S. are those formed when roughened surfaces are placed in apposition with one another, as between the palatine processes of the maxillae. True and false S. are further subdivided. The true are of three kinds, namely, *sutura dentata* (toothed), *seriata* (saw-edged), and *imbosa* (overlapping). There are two varieties of false, which are known as *sutura squamosa* and *harmonia*. There is a great variety of Ss. which are used in bringing together the lips of a wound.

**Suva**, cap. of the Filis Is., in the Is. of Viti Levu. Pop. 11,400.

**Suvla Bay, Battle of**, see GALLIOLI CAMPAIGN.

**Suvórov**, or **Suvórov-Rymnikski**, **Alexander Vassilyevich**, Count, Prince Italinski (1729-1800), Russian soldier, b. in Moscow. He obtained a lieutenantcy in a regiment of the line, was raised to the rank of first-lieutenant three years afterwards, and in 1758, when the war with Prussia broke out, received command of the garrison of Memel. In 1759 he was present at the battle of Kunnersdorf. Catherine II., in 1763, named him colonel of the Astrakhan regiment of infantry. Five years afterwards he was commanding officer of a part of the Russian troops which were engaged in warfare with the confederation of Bary in Poland. On his return he was made major-general, and in 1773 he was sent against the Turks under F.-M. Rumyantsov. Three victories by S. over the troops of Mustapha III. prepared for the complete defeat of the Turks, and, having effected a junction with the army of Gen. Kamenskoy, a fourth victory in June 1774, put an end to the struggle. Immediately afterwards he defeated the insurrection of the Don Cossack Pugacheff. In 1783 he subjugated the Kuban Tatars and those of Budziac, and was raised to the chief command, which he held throughout the second Turkish war, which broke out in 1787. In 1789 S. won the battle of Fokshany and captured Ismail. In 1792, when peace was made between Russia and the Porte at Yassy in Moldavia, the Empress Catherine appointed S. governor-general of the prov. of Yekaterinoslav, the Crimea, and the lately acquired provs. round the mouth of the Dniester. In 1794, when the Poles revolted, S. was sent against them. He

gained sev. victories over the insurgents, culminating in the capture of Pragal. On this occasion Catherine made him a field marshal. In 1799, after the death of Catherine, the Emperor Paul gave him the command of the troops which fought in Italy against the Fr. He inflicted sev. defeats on the latter and took his army into Switzerland across the Alps, but was recalled by the tsar. S. died shortly afterwards. He was one of the greatest Russian soldiers, and a military decoration is named after him. See lives by W. L. Hiese, 1921, and K. Olskov (Eng. trans. 1914).

**Suwanee**, riv. of the U.S.A., rises in Georgia, flows S., and then enters the gulf of Mexico. It is navigable as far as White Springs. It is the 'Suwanee R.' mentioned in the well-known song *Old Folks at Home*. Length 240 m.

**Suwarow** (botanical), see *CARYOPAR*.

**Suzerainty**, in international law a distinction is drawn between dependent states under S. and those under protection (see *PROTECTORATE*). A state under S. is one which has acquired certain of the attributes of international dependence from having become part of the suzerain; in all other respects it is presumed to remain dependent so that, for example, it is in a state of war when its suzerain is at war. In theory, the position of a state under S. does not differ from that of an individual state in a federation. Since the dissolution of the Holy Rom. Empire in 1806, states under S. have become rare, the chief instances being almost confined to states under the S. of the Porte, e.g. Moldavia, Wallachia, and Serbia, which had, however, definitely shaken off the Turkish yoke before being recognised, in 1878, as independent states. For long Egypt was in an anomalous position, for while nominally under the S. of the Porte, she was really a part of the Brit. Empire (see further under *EGYPT*). Korea furnishes an instance of a modern state which was under S., the country remaining under the S. of China until the Sino-Jap. war of 1894-95, which terminated China's claim; but Korea's nominal independence soon yielded to annexation by Japan.

**Suzor-Côté**, **Aurèle de Foy** (1869-1937). Canadian artist, b. at Arthabaska, prov. of Quebec. He studied in Paris at the Ecole des Beaux-Arts and the Académie Julien and Colarossi, and became R.C.A. in 1914. His landscape and figure work is marked by its simplicity, strength, and accuracy. Important pictures include 'Return from the Harvest Field,' 'Autumn Landscape, Evening,' 'Youth and Sunlight,' and 'The Settlement on the Hill-side.'

**Svalbard**, see *SPITS-BERGEN*.

**Svastika**, see *SWASTIKA*.

**Sveaborg**, fortress on the gulf of Finland, occupying sev. is. 3 m. S. of Helsinki, called 'the Gibraltar of the North.' It was fortified in 1749 by the Swedes.

**Svealand**, see under *SWEDEN*.

**Svendborg**, seaport of Denmark on the is. of Fünen in Svendborg Sound, 23 m. S.S.E. of Odense. It has one of the best

harbours on the is. and is an outlet for the produce of the adjacent is. There are tanneries, shipbuilding yards, and foundries, and it exports agric. produce. Pop. 20,000.

**Svendrup, Harald Ulrik** (b. 1888), Norwegian meteorologist and oceanographer, b. at Sogn, W. Norway. He had a univ. education, and became assistant to Prof. Bjerkness, the meteorologist, in Oslo and Leipzig. He was the leader of scientific work on Amundsen's *Maud* expedition 1917-25, and again on the *Nautilus* expedition in 1931. From 1936-1948 he was prof. of Oceanography at the univ. of California. He is the author of many treatises, mainly about meteorology and oceanography, and is a director of the Norwegian Polar Institute, and chairman of the International Commission for Polar Meteorology.

**Svendsen, Johan Severin** (1840-1911), Norwegian composer, b. in Oslo. He was court conductor at Copenhagen from 1880 to 1911. His works, which show an attachment to the influence of his homeland, include four Norwegian rhapsodies, two symphonies, and other orchestral and chamber compositions, and songs.

**Sverdlovsk**: 1. Region of the R.S.F.S.R. in the Urals, covering, with the Molotov Region to the W., the area of the old Perm prov. The black earth areas in the E. of the region produce wheat, rye, and oats. The W. part is the industrial centre of the Urals, with mines of gold, platinum, copper, asbestos, and coal. There are heavy industries, and wood and textile manufs. Area 85,268 sq. m. Pop. 2,512,000. 2. Formerly **Ekaterinburg**, cap. of the above, on the Asiatic side of the Urals, 200 m. S.E. of Molotov. Developed after the revolution, it is the chief mining tn. of the Ural Mts. The Central Urals Copper-smelting Combine near S. is the chief centre of the non-ferrous metals industry. Copper is mined and refined at Revda, near S. Tungsten ores are mined to the south of the tn. Platinum and phosphorus are also worked. Machinery for the metallurgical and mining industries is manufactured here. Its electric power station is linked by high voltage transmission cable with the other chief power stations in the Ural industrial region. Its other manufs. include linen, soap, candles, and precision instruments. There are also estabs. for polishing precious stones, and trade is carried on in cattle, cereals, iron, and woollen goods. It has a univ., two cathedrals, a monastery, and a mint for copper coinage. Here, in a house belonging to Ipatiev, the tsar, Nicholas II., his wife, and only son were murdered by the Bolsheviks in 1918. Pop. 425,500.

**Sverdrup, Otto** (1854-1930), Norwegian explorer, b. at Bindal. Going to sea while still a boy, he had already had wide experience when he joined Nansen's expedition of 1888, which crossed Greenland from E. to W. Nansen offered him the command of the *Fram*. In 1895 the ship was left in the pack-ice while Nansen made his abortive dash for the Pole. The manner in which S. navigated the *Fram*

home through the pack-ice was an epic of polar exploration, and was warmly praised in Nansen's *Farthest North*. From 1898 to 1902, S. attempted to circumnavigate Greenland. When he found that the way was blocked he turned his attention to exploring Grinnell Land, to the W. of Greenland, reaching a point some 82° N. in 1902. He sailed up Nansen Sound and Greely Fjord, into the heart of Grinnell Land, before turning back, the expedition occupying four years. Among the is. he discovered on the expedition were Axel Heiberg, King Christian Is., and the Ringnes Is. These have since been known as the S. Group, Canadian sovereignty over them being recognised in 1931. In 1914-15 he had charge of an expedition for the relief of missing Arctic explorers, and in 1920 he went to the rescue of the Russian icebreaker *Solovoi*, which was ice-bound in the Kara Sea.

**Sverre** (1151-1202), king of Norway, a native of the Færeviks Is. He was proclaimed king in 1177, having been adopted as leader by the Birkebeiner. He was a military genius, and having defeated and slain Magnus at Nordes (1184), built up a powerful monarchy with the aid of the landowners. But he had as his enemy the Church, and in 1198 the land was laid under an interdict. S.'s last years were harassed by the rise of the Baglers or 'croziermen.'

**Svistov**, see **SISTOVA**.  
**Swabia**, medieval <sup>Ger.</sup> duchy lying between Bavaria, Franconia, and the Rhine, once called Alamannia. After the fall of the Carolingian Empire the duchy was re-established, and in 1079 came into the possession of the Hohenstaufen. During the reign of Charles IV. (1316-78), emperor of the Holy Rom. Empire, the Swabian cities were leagued together and involved in the so-called 'war of the cities' (1377-89) in opposition to Charles's favourite, Everard II. of Württemberg, the counts of Württemberg having held authority over S. since the middle of the thirteenth century. Everard finally defeated the League, but a second Swabian League was formed in 1488 for the maintenance of public order, and with the support of the dukes of Bavaria regained their ter. from Ulric of Württemberg in 1519. The League continued its arbitration with success until 1534, when it expired. The name is generally applied to the area, and particularly to part of Bavaria. It is a fruitful agric. region with numerous small and medium-sized tns.

**Swadlincote**, urb. dist. of Derbyshire, England, 12 m. from Derby and 4 m. from Burton-on-Trent. There are earthenware and fireclay manufs., and in the vicinity are coal-mines. In the urb. dist. are Stanton, Newhall, and Church Gresley. Pop. 22,000.

**Swaffham**, mrkt. tn. of Norfolk, England, 15 m. S.E. of King's Lynn. It has a fine church with a carved roof of wood, a grammar school, and a market cross. There is considerable agric. trade. S. is noted for its cattle and sheep fairs. Pop. 3000.



**Swahili**, people inhabiting the coastal region of Kenya Colony and Tanganyika Ter., between Mombasa and Zanzibar. They are of Bantu origin, but have mingled freely with the Arabs, who have greatly influenced their customs, language, and religion. Most are Mohammedans, and their language Kiswahili (or Ki-Swahili) i.e. 'language of the coast,' usually in a debased form, is used as the *lingua franca* of E. Africa. Pop. about 1,000,000. See also under NEGRO-AFRICAN LANGUAGES, *Bantu*.

**Swain's Island**, see SAMOA.

**Swaledale**, in the N. Riding of Yorkshire, England, is 20 m. in length from Keld to Richmond. It is the narrowest and grandest of the N.W. dales. The Swale is noted for its waterfalls and fishing. Up to 1880 lead-mining supported a larger pop. than the agric. one of to-day. S. gives its name to an important breed of horned sheep. The spectacular Buttertubs Pass (1682 ft.) connects S. and Wensleydale. Arken-garthdale, a branch dale, starts from Reeth, the largest vil. once a mkt. tn., to lead to Tan Hill Inn, England's highest inn (1732 ft.). Below Reeth are the ruined nunneries of Marrick and Ellerton. See Ella Pontefract, *Swaledale*, 1934.

**Swaledale Breed**, see under SHEEP.

**Swallow** (*Hirundo rustica*), well-known passerine bird, widely distributed throughout Europe during the summer, but winters in Africa and tropical Asia. It begins to arrive from the end of March, but in the course of its migration it is destroyed in large numbers in S. Europe for its plumage, and its numbers appear to be gradually diminishing. Its back and wings are blue-black; the throat and forehead chestnut; and the breast pale buff or pinkish. Its two outside tail feathers are elongated into a graceful fork, which is more pronounced in the male. Its nest, somewhat like a flattened cup, is made of mud, straw, hair, and feathers, and is usually built attached to the rafters or bars. S. feed entirely on winged insects, capturing them in the open mouth, which is lined with bristles made viscid by a salivary secretion. They are therefore of great economic value, and the increasing prevalence of gnats and other insects may often be traced to the disappearance of this bird. Other species include the red-rumped S. (*H. rufula*) of the E. Mediterranean. In the same family (Hirundinidae) are the martins. *Chelidon urbica*, the house martin, is smaller than the S. and also differs in having feathered feet and a pure white under-surface; its tail is less sharply forked and its wings are shorter. *Cotile riparia* is the sand martin.

**Swallowing**, or **Deglutition**, act by which food leaves the mouth cavity for the gullet. The contraction of the tongue muscles pushes the food from the top of the tongue backwards to the fauces. The soft palate is then raised by reflex action to prevent the food proceeding to the nasal cavity, and the glottis closes to prevent it entering the larynx. The constrictor muscles of the pharynx then urge

the food into the gullet, where it is impelled towards the stomach by peristaltic action. S. is assisted by the secretion of saliva, especially in snakes.

**Swan**, Sir Joseph Wilson (1828-1914). Brit. inventor, b. in Sunderland, and educated locally. The carbon process of printing in photography, the development of the 'rapid' plate in the same science, and many improvements in the processes of electro-reproduction, are due to him. He is best known, however, for the incandescent filament electric lamp, 1879, which was the first successful lamp of its kind. He also invented a miner's electric safety lamp. He became F.R.S. in 1894 and a knight in 1904.

**Swan** (*Cygnus*), genus of birds with elongated body and neck and short feet. The base of the bill is fleshy and naked, and the sexes are similar in plumage. About eight species are known, of which four have been known to visit Britain in the wild state. The mute S. (*C. olor*), supposed to have been brought by Richard I. to England from the cruades, is the semi-domesticated bird of rivers and ornamental waters. It has the front part of the bill orange. Its young are greyish-brown, while those of the smaller Polish S., a sub-species, are white. The whooper or whistling S. (*C. muscus*) has no knob at the base of the bill, the tip of which is black; it differs also in the carriage of its head and neck. The plumage is pure white with dull black legs and feet. It nests in the Arctic regions, Iceland, and Scandinavia and winters in Britain. Bewick's S. (*C. bewicki*), the smallest Brit. S., is a rarer winter migrant. The bill is black and the deep yellow of the basal portion does not extend below the nostrils. The trumpeter S. (*C. buccinator*) is a N. Amer. bird of great size. The bill and feet are entirely black. Another N. Amer. species is the common Amer. S. (*C. columbianus*), which usually has a yellow patch in front of the eye; it is slightly smaller than the trumpeter. Other species are the black-necked S. (*C. nigricollis*) of S. America and the black S. (*C. atratus*) of Australia, the favourite location being Swan Bay, an inlet near Port Stephens. It was first introduced into Europe early in the seventeenth century.

'Swan, The,' see CYGNUS.

**Swanage**, holiday resort on the coast of Dorset, England. There are quarries of Purbeck stone. Pop. 7500.

**Swanee River**, see SUWANEE.

**Swansea** (Welsh *Abertawe*), mkt. tn., seaport, and parl. constituency, and municipal bor. of Glamorgan-shire S. Wales, 45 m. W. of Cardiff, at the mouth of the R. Tawe, on a bay at the landward end of the Gower Peninsula. The industrial and maritime activities of S. are carried on eastwards of the High Street, the works and wharves bring in the valleys beyond and down at the mouth of the Tawe. The residential parts of S. are well built, with wide streets and many parks, and have spread along the bay and over the hills behind to a height of 600 ft. above the sea.

The castle, said to have been originally built about 1120, was rebuilt in the mid fourteenth century; it is notable for its exterior arcading. The old guildhall or tn. hall, near the docks, built in 1847, is in the It. style. The new civic building, with lofty central tower, in Victoria Park, embraces the new guildhall, law courts, and Brangwyn Hall. Other prin. buildings are the Royal Institution of S. Wales, with a museum and a library; the public library, which includes the Corporation Art Gallery; the Glynn Vivian Art Gallery; and the Exchange Buildings or Chamber of Commerce. There are four large secondary and grammar schools, the oldest of which is the boys' grammar school founded in 1682 by Hugh Gore, bishop of Waterford. The Univ. College of S., a constituent college of the univ. of Wales, was estab. in 1920. Other educational institutions are the Municipal Technical College, the Municipal School of Arts and Crafts, and the Women's Training College.

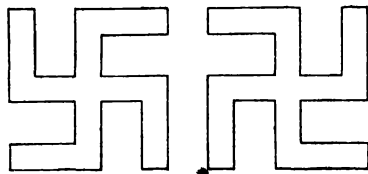
The port of S. is the natural centre of the tn.'s commercial importance. Many industries have grown up round it, and there are numerous collieries within a radius of 20 m. Long recognised as the chief metal port of Great Britain, S. is now also the greatest Brit. oil port, while remaining the leading centre of the tinplate trade. The largest docks are the Queen's, opened in 1920 (150 ac.), and the King's (71 ac.), the former used for the oil trade. The South Dock basin is the centre of the fishing industry. Exports handled at the port are coal and coke, steel rails and iron work, tinplates, oil, merchandise, grain and flour, and cement; the imports are oil, merchandise, pitwood and mining timber, grain, and flour, copper ores, iron and steel, etc. There are also a municipal dry dock for vessels up to 2000 tons and a number of privately owned dry docks. In addition to its coal (the industry began in 1200) and oil, S. has natural resources in limestone, silica, brick earth, shales, sand, etc., and has for many years been the centre of one of the prin. steel-producing areas in the Brit. Isles, and most of the Welsh steel sheet and tinplate works are situated within a radius of 15 m. of the tn. S.'s metallurgical importance was founded on copper ore, and copper works multiplied from the early eighteenth century. The scientific process of refining the ore was initiated in the S. dist. The oil-refining industry yields a wide range of products. Steam trawling is also a thriving activity. Other industries are chains and lifting tackle, paint, batteries and accumulators, brewing, bricks, building and structural engineering, chemicals, concrete, electrical fittings, machinery, ship-repairing, zinc, and sulphuric acid. S. was a Rom. settlement and the tn. grew up around a Norman castle. It received a new charter in 1655, and in 1888 it became a co. bor. It returns two members to Parliament. S. suffered from heavy air raids in Feb. 1941. Pop. 164,800.

**Swansea Bay**, bay in Glamorganshire, Wales.

**Swanwick, Anna** (1813-99), Eng. educationist and feminist, b. at Liverpool. By her work in connection with the women's colleges, such as Bedford College, Gilton, and Somerville, she did much to further the cause of the higher education of women. In addition to her philanthropic and scholastic work she pub. sev. books, making trans. from the Gk. and the Ger. See life by M. L. Bruce, 1903.

**Swaraj**, term usually interpreted as meaning 'home rule for India.' See under INDIA, *History*.

**Swastika** (from Sanskrit *su*, 'well' and *as*, 'to be,' 'all be well'), a most anct. and widespread decorative motive, is also known as *fulfol* (perhaps from 'fill-foot,' i.e., a pattern 'filling the foot' of a painted window) or *fulfol cross*, or *croisse cramponnée*. In form the S. is a Gk. cross, the arms of which are like elbow-joints, all bent at right angles. It is to be found on early Elamite (Persia) ceramics of the fourth millennium B.C., as well as on ceramics of the second and first millennium



SWASTIKA

B.C. from Troy, Greece, Cyprus, India, Tibet, China, Japan, etc. It is also found in Christian inscriptions from the second century onwards, as well as among the Amerindians. It was often used as a charm against 'the evil eye,' and was used as a religious symbol by the Buddhists and Jains. Its origin is uncertain, but it seems to be a sun symbol, perhaps representing the movement of the sun. Adopted in 1910 by some Ger. groups as the symbol of the 'Aryan race,' it later became the official symbol of the Nazis.

**Swat:** 1. State of the Malakand Agency in the tribal ter. of the N.W. Frontier Prov. of Pakistan. Area 1000 sq. m. Pop. 446,000. 2. Riv. of the above, rising near the Kashmir border and joining the Panjkora after a southerly and south-westerly course. There is an irrigation scheme in its valley, and rice is grown.

**Swatow**, treaty port of China in the prov. of Kwangtung, on the E. coast at the mouth of the R. Han, on the railway to Canton. Wolfram is mined and sugar produced. The port was opened to foreign trade in 1860. Pop. 178,700.

**Swaziland** (called by the natives **Kwa Ngwane**), Brit. protectorate in the S.E. corner of the Transvaal, between the Drakensberg and Lebombo Mts., separated from Portuguese E. Africa and Natal on the E. by the Ubomo Mts. It is administered by the high commissioner for S. Africa through a resident commissioner at Mbabane. It has an area of 6704 sq. m. and a pop. of 186,800, including

183,400 Bantu and 2900 Europeans. Ama-Swazis are a branch of the Bantu race. The country is divided into three regions, running N. to S.; on the W. is the high veldt (4000 ft.), in the centre the middle veldt (2000 ft.), and in the E. the low or bush veldt (1000 ft.). The country is well watered, especially the high and middle veldts, and the climate is good except for a few months of extreme heat in summer. The low veldt is, however, somewhat malarial. The country has fine grazing land, and stock-raising is the chief occupation of the inhab., cattle numbering some 435,000. The agric. products consist of maize (the staple product), Kafir corn and other cereals, ground-nuts, avocado pears, pumpkins, beans, tung nuts and sweet potatoes, cotton, and all kinds of fruit. Tin (alluvial) and gold are produced; coal is known to exist in large quantities in the low veldt. Other minerals are copper, pyrites, and asbestos, the latter now produced in large quantities at the Haycock mine. The chief exports are cattle, hides and skins, asbestos, tin, and tobacco. A police force was created in 1907, and is composed of twenty-seven Europeans and 149 natives. There are six gov. and one private school for Europeans, three for Europeans, and 198 for natives. Mbabane (European pop. 500) is the cap., and Bremersdorp, the former cap., is the only other town of importance. There are no railways, and roads are in process of improvement. In 1947-48 revenue was £335,465 and expenditure £413,814. The independence of S. was recognised by the Boers by the conventions of 1881 and 1884. A Boer colony settled there in 1886. Dual control was set up between Kruger and Great Britain, 1890. In 1894 administration, subject to reservations as to native rights, was taken over by the Transvaal. After the S. African war a professional administration was estab. and then, in 1906, it was made a Brit. Protectorate under the high commissioner for S. Africa. An elected European advisory council on European affairs was estab. in 1921. See Sir Lord Hailey, *African Survey*, 1938; B. A. Marwick, *The Swazi: an Ethnographic Account of the Natives of the Swaziland Protectorate*, 1910; and Hilda Kuper, *An African Aristocracy*, 1947, and *The Uniform of Colour*, 1948.

**Swearing** in its various forms, cursing, blasphemy, profane and obscene language, is an offence which is either dealt with summarily under an Act of 1745, or in case of blasphemy (q.v.) by indictment. Under the Act a scale of charges varying with the social status of the offender was imposed. It is still in force, but is not often made use of, because convictions can be obtained against most local offenders under either: (1) the Town Police Clauses Act, 1847, which punishes profane or obscene language in the streets, if uttered to the annoyance of residents or passengers, with a fine not exceeding 40s. or imprisonment with hard labour; or (2) the Metropolitan Police Courts Acts for S. in metropolitan dists.; or (3) by laws made under the Local Government

Act, 1888, and the Municipal Corporations Act, 1882, framed for the punishment of S. in the dists. of municipal corporations. See also OATH.

**Sweating**, see under DIAPHORETICS; SKIN.

**Sweating Sickness.** A curious malady first observed in England in 1485; subsequent epidemics occurred in Calais, among the Eng. inhab. only, in 1507, 1518, 1529, and 1551. It also occurred in Germany in 1652, 1802, 1861; and in France in 1718 and later. The onset was sudden, and was heralded by profuse, often foetid sweating, with dyspnoea and malaise; the tongue was coated, headache was complained of, and cerebral symptoms were common. A rash appeared in a few days. The disease was regarded with dread and was often fatal. The only modern diseases resembling S. S. are *miliary fever* (a disease observed in France, Germany, and Italy, but not in Great Britain), and measles, but it cannot be identified with either, or with any other infectious diseases known at the present day.

**Sweating System.** The S. S. of labour arose at the beginning of the nineteenth century, and was caused primarily by the practice of contractors placing the labour involved with sub-contractors. The system became known as the 'contract system,' and operated principally in the clothing trade. The system became a social scandal. It made possible the employment of impoverished unskilled workers at starvation wages, the work being done mainly in their own homes, though some of it was done in wretched dwellings belonging to the 'sweaters.' The evil attracted the attention of Charles Kingsley, who wrote a widely read pamphlet under the pseudonym of 'Parson Lot' called *Cheap Clothes and Nasty*, and Tom Hood, whose *Song of the Shirt* made an impression equally deep. Kingsley and Hood attacked the system upon humanitarian grounds, but authorities like Seligman wrote of it from the standpoint of sociological study. The effect of these exposures, and of the results of a House of Lords committee of 1888, led to an agitation against the system at the end of the century. The rapid increase of immigration of poor foreigners attracted by prospects of employment at rates of pay higher than those in their own country increased the evil. It was difficult for the sweated workers to organise themselves against exploitation because their work was for the most part temporary, depending upon the fluctuation of the business. They were therefore severely handicapped in any attempt to combat the low wages, long hours, and unhealthy conditions of their employment. The estab. of trade boards which prescribed a minimum wage, and the development of modern mass production, caused the decline of the system.

**Sweden (Sverige)**, country of N. Europe comprising the E. portion of the Scandinavian peninsula; it is bounded on the N.W. by Norway, on the E. by Finland, the gulf of Bothnia, and the Baltic Sea, on the S. by the Baltic Sea, and on the W. by

the Kattogat. Its area (see below) includes the great lakes of Vänern, Vättern, Mälaren, and Hjälmaren. The N.W. part of the country is mountainous, the highest peak, Kebnekaise, reaching about 7000 ft.; the remainder is flatter, sloping to the E. and divided by many rivs., notably the Dal, Indal, Angerman, and Skellefte. This part may be regarded as divided into three separate regions: the N., or forest region; central, mining or agric.; and southern, agric. In spite of its northerly position S. has a relatively mild climate, owing to the influence of the N. Atlantic Drift. Climatic variations are, however, considerable: the average temp. in the south is 45° F., and in the N. (where summer only lasts two months) it is 36° F. The rainfall varies in different parts of the country, the average being 20-24 in. per year.

**Area and Population.**—The area of S., including lake water, is 173,378 sq. m. Its pop. in 1920 was 5,900,000, but since then has increased by almost exactly 1,000,000. The urban areas contain 42 per cent of the pop., smaller townships 19 per cent, rural areas 39 per cent. These figures include some 35,000 Finns and 10,200 Lapps. Pop. of the largest tns. (1949) is: Stockholm (the cap.), 733,600; Göteborg (Gothenburg), 343,900; Malmö, 185,900; Norrköping, 83,200; Helsingborg (Helsingborg), 70,700; Örebro, 64,700; Uppsala, 60,400; and Borås, 55,900.

**Political Divisions.**—The historical divs. of S. are Svealand, Götaland, and Norrland. The two former represent an old div. which, in turn, represents a difference of race and tradition, and which was divided by the great forest lands of S. Svealand may be regarded as the essential part of S., the mother prov. Here at the outlet of Lake Mälaren is to be found the cap., Stockholm, one of the finest cities of Europe. The modern tn. far exceeds the limits of the ant. one, but here still exist the old palaces and burial places of the royal house, fine schools and colleges, and many magnificent buildings. The tn. itself is the centre of the chief industries of S. and has a huge import trade, though its export trade is exceeded by Göteborg and Malmö. In the immediate neighbourhood is the tn. of Uppsala, which contains an historic cathedral and the oldest of all the Swedish univs., founded in 1477. The tn. of Falun, also in this dist., is noted for its copper-mines. Norrland (comprising the N. half of the country) has numerous coastal tns., most of which are at present increasing in size and prosperity; e.g. Gälle, Sundsvall, Umeå, and Luleå. The interior has few tns. of any size, but is especially notable for the many modern well-planned viks., which are being built to house the timber workers. A railway connects the mines of the Gallivare dist. with Luleå.

Within these three divs. are twenty-four administrative provs. (*län*) and the city and rural dist. of Stockholm. The provs. are governed by a prefect. Stockholm is governed by a governor. Both governor and prefects are nominated by the king.

**Religion and Education.**—There is complete religious freedom in S., though more than 97 per cent of the pop. adhere to the state church which is Lutheran Protestant. Since 1842 elementary education has been compulsory and free. For those entering employment immediately on leaving the elementary schools a course in the continuation school is compulsory. In secondary education the standard of technical education is particularly high. Besides the univ. at Uppsala, there is a state univ. at Lund (founded 1666), and a state medical faculty at Stockholm.

**Social Welfare.**—S. was one of the pioneer nations in the development of state-run social services: there are compulsory schemes guaranteeing old age pensions, medical treatment, maternity benefits, etc. In addition, since the beginning of the twentieth century, Swedish municipalities and other public bodies have built many modern residential estates, comprising flats and houses, in tn. and country to replace former slum-areas or undeveloped hamlets, and many Swedish building projects have served as models for similar schemes all over W. Europe.

**Government and Justice.**—The theory of Swedish gov. is grounded in four fundamental laws: the constitution of 1809; the amendment of 1866, constituting the Diet or *Riksdag*, and subsequent minor modifications in 1909 and 1921; the succession law of 1810; and the law of 1812, granting freedom of the press. Swedish elections, central and local, are by proportional representation. The *Riksdag* is divided into two chambers: the first being chosen on regional lines (*i.e.* elected by members of the prov. assemblies and councillors of six specified tns., which are not represented in the prov. assemblies), the second by universal suffrage every four years. Candidates for the second chamber must be over twenty-five years of age resident in their own constituency. All laws require the royal assent. Power to initiate taxation is reserved to the *Riksdag*. The executive rests with the king, acting on the advice of his Council of State. The sovereign and members of the Council of State must be members of the estab. (Lutheran) Church. Elected co. and city councils (in specified tns. and tns. of more than 100,000 pop.) handle medical facilities. Municipality committees are autonomous in, for instance, poor relief, child welfare, old age pensions, unemployment relief, public utilities, law and order.

Judicial administration is not dependent on the gov. Its administration is supervised by the chancellor of justice (appointed by the king) and the attorney-general, appointed by the *Riksdag*. New rules dealing with legal procedure have been operating since 1948. Trial by jury is used only for cases dealing with the freedom of the press.

**Finance.**—The basic monetary unit in S. is the krona (plural kronor). The rate of the krona to the £ in 1950 was 14.50. The gov. budget for the fiscal year from July 1, 1947, to June 30, 1948, showed the

following estimates of income and expenditure (figures in million kronor). Revenue: income tax, 1876; import duties, 329; car tax, 263; tobacco tax, 397; liquor tax, 517; other taxes and sources of income, 797—total, 4179. Expenditure: national defence, 756; social welfare, 960; roads and other communications, 241; univs., schools, libraries, museums, churches, 482; agric. subsidies, 128; other expenditure, 966—total, 3533.

Direct taxes are paid in S. to the central gov. as well as to local authorities. The former are progressive, whereas the latter are proportional to the income. A system of family allowances came into force in 1918, allowing 260 kronor each year for every child under sixteen.

has a great export trade with Britain. Forests cover 56 per cent of the total land area, and as far as trade returns are concerned, timber export is S.'s greatest industry. Allied to this is the production from timber of pitch, tar, cellulose (sulphite pulp), and manufactured wood-pulp for paper-making; Swedish manufacturers have almost a world monopoly in the match industry. A fairly small textile industry is centred at Norrköping and Borås. The fishing industry is large, catches being valued as high as 90,000,000 kronor a year. Tourism is an increasingly important industry in S. The mineral wealth is enormous, the iron-mining industry being the greatest and most important. Huge



Swedish Tourist Traffic Association

#### SMÅLAND HARVESTING ON THE SLOPES NEAR GRANNA

In the background is Lake Vattern

**Communications.**—Thirty-five per cent of all Swedish railways are electrified, and 88 per cent are gov.-owned. Total length of the railways is over 10,000 m. The road system totals 55,890 m., although only 3000 m. are hard-surfaced; fourteen national highways form the prin. traffic arteries. All parts of S. are linked by the services of A.B.A. (Swedish Air Lines).

**Agriculture, Industry and Minerals.**—S. is on the whole agric. and livestock are reared in many parts. This is an industry for which much of the country is very suitably adapted. The provs. which yield the greatest increase are Skåne and Halland in the S.W., and here much progress has been made during recent years. Nearly 30 per cent of the pop. are engaged in agriculture, over 240,000 being owners and 56,000 tenants of the land they cultivate. The prin. crops are oats, wheat, rye, barley, and potatoes. The wealth of forest lands and the excellence of the timber grown have done much to promote an industry which is still increasing steadily and

iron-ore deposits are to be found in Bergslagen and in Lappland; 8,895,000 tons were produced in 1947. Other minerals include silver, lead, copper, zinc, manganese, arsenic, gold, and aluminium. There is a very small coalfield in the extreme south of Lappland, which produced 415,785 tons in 1947. Lacking coal, S. has developed hydro-electric power to a great extent; the electrical industry is indeed one of the most flourishing in S. Three-quarters of the water power resources are situated in Norrland; the country's total possible output is estimated at over 40,000,000,000 kilowatt hrs. annually.

**Foreign Trade.**—The salient feature in S.'s trade since 1945 has been the unfavourable balance of trade, with import vol. largely exceeding and exports substantially lagging behind pre-war levels; 1948 imports were 113 per cent and those of 1947 96 per cent of the 1936-38 average; 1948 exports were 82 per cent, and the 1947 vol. 64 per cent of pre-war average. Greatest 1948 imports were

from Britain (17.2 per cent), U.S.A. (14.1 per cent), and Benelux (11.1 per cent). Exports in 1948 were 17 per cent to Great Britain, 15.2 per cent to Scandinavia, and 12.2 per cent to the Benelux countries.

**Defence.**—Military service is universal and compulsory, about 35,000 men being trained annually; the war strength of the army is about 600,000 based on modern lines and mechanised. A home guard for local defence is attached to the army. The Swedish Navy consists of more than 100 vessels, including coastal defence craft, cruisers, destroyers, and submarines. There are naval bases at Stockholm, Karlskrona, and Göteborg. By 1949 one billion krona had been spent on new aircraft, including Brit. Vampire fighters and the Swedish jet fighter, the Saab J-29, capable of 650 m.p.h.

**History.**—The prehistory of S. is of great importance in a study of the early settlement of N.W. Europe. There has been much detailed research along modern lines, particularly into the chronological relation of archaeological cultures and the phases of glaciation. A convenient summary is to be found in H. Shetelig's and H. Falk's *Scandinavian Archaeology*, 1937, but most of the literature is in Swedish technical pubs. The early hist. of S. is wrapped up in legend and saga. The country appears to have been inhabited by two separate but closely related races, the Sver and the Goter, names which can, of course, be traced in many place-names at the present time. The old mythology of the N., or debased forms of it, remained the religion of many of the people until the twelfth century, although Christianity was introduced at a very much earlier period. It failed, however, to assimilate the whole of the country until much later. During the fourteenth century Finland was added to the territory of S., but the ruling dynasty of S. was so weak that the nobility and clergy were able to extort privilege after privilege, which left the monarchy weak. Finally in 1397, they united themselves with Norway and Denmark by imploring the aid of Margaret of Denmark, who by the Union of Kalmar united the three kingdoms. But the union was far from being successful. It succeeded in its immediate aim, but later monarchs became irksome to the Swedes. They had no sympathy with a monarch, Ger. in race and ideas, who would do little for their national aspirations. They formed national parties, and sev. times rebelled, their most famous leader being Engelbrecht Engelbrechtsson. They were not successful, however, until the sixteenth century. Christian II. of Denmark aimed at the extirpation of the Swedish nobility; S. rebelled under Gustavus Vasa, a Swedish noble, who, in 1523 after a two years' rebellion, was acclaimed and elected by the *Riksdag* as Gustavus I. of S. But S. did not regain total freedom immediately. Denmark still held possession in the S. mainland and the is. of Gotland.

Gustavus I.'s reign marked a period of

the struggle between Catholicism and Protestantism. A dispute between king and papacy over an appointment to the archbishopric of Uppsala led to a breach with Rome and the introduction of Lutheranism. The enrichment of many of the nobles as well as of the crown from the confiscated eccles. (especially monastic) property, ensured the permanence of Lutheranism in S., and by 1529 Protestantism had been adopted as the state faith, largely for political and financial reasons. By the end of his reign Gustavus had estab. some stability and some financial soundness in the country, but his work was not continued by his sons, Eric XIV. (1560-68) and John III. (1568-1592), both of whom inclined towards Rom. Catholicism and did little by their foreign wars, chiefly with Denmark and Russia, to strengthen their country, though Estonia was eventually acquired at the cost of many years of war. John III. made a serious attempt to restore Rom. Catholicism in S. His son Sigismund, also a Rom. Catholic, became king of Poland in 1587, succeeding his father as king of S. five years later. His efforts to convert the country were opposed by all classes, for Lutheranism had by this time become a popular religion. In 1600 he was deposed in favour of his uncle, who succeeded him as Charles IX. Charles aimed at a great Protestant League, of which he should be the leader, but he died before he had accomplished this, leaving the throne to Gustavus Adolphus.

S. in 1641 was lacking in pop., internal communications, and material resources, and her geographical position was unfavourable for the expansion of her trade, since her way to the open sea was controlled by Denmark. Gustavus Adolphus had great military and political capacity, he began the policy of turning the Baltic into a 'Swedish lake'. He ended the war with Denmark, recovering ter. lost by his father. War with Russia gave S. control of what is now the Baltic coast of Russia, whilst war with Poland ended in a truce (1629), which confirmed S. in possession of Livonia and gave her a grip on the mainland of Germany. Gustavus Adolphus now appeared as the Protestant champion of Europe. Between 1629 and 1631 he won a series of spectacular triumphs; the Catholic League was defeated, the Catholic general, Tilly, outmanoeuvred and finally killed, and Gustavus Adolphus was able to penetrate to the south. He was recalled by the attacks of Wallenstein in Saxony, and fell at the victory of Lutzen in 1632. He was the real founder of the greatness of S. He made her a strong power by his domestic and financial reforms, and he won for her a great place in the councils of Europe. The gov. was centralised and strong; the army was reformed; and S. for the next century was one of the great powers in Europe. In fact, her resources were always strained to the utmost to maintain this position; and her Baltic possessions were to embroil her in a series of wars which she could not afford but without which she could not hope to keep them. Gustavus Adolphus

was succeeded by his daughter Christina, whose minority was made famous by the statescraft of the chancellor Axel Oxenstjerna. The success of S. was seen at the treaty of Westphalia, which marked the zenith of Swedish power. She became the controlling power of Germany, the Protestant champion of Europe, and the greatest power of the N. In 1645 Denmark was forced to give up her right to tolls in the Sound and ceded Halland to S. In 1654 Christina became a Catholic

fare, and it was at this stage that the strain of maintaining a scattered empire, surrounded by ambitious countries with large pops. and resources, began to tell on a country which had only a small pop. and few natural resources of her own. Charles astonished Europe by his enterprise and dash, and won many brilliant victories, penetrating, on one occasion, deep into Russia. But he had against him a formidable coalition of powers, and his schemes were too grandiose to be possible



*Swedish Tourist Traffic Association*

CHARLES XII RECEIVING THE RUSSIAN STANDARDS AFTER THE BATTLE OF NARVA, 1700

The painting 'Narva,' by G. Cederström, in the National Museum, Stockholm

and abdicated in favour of her cousin Charles X. He continued the work of Gustavus Adolphus. He attacked Denmark and gained some ter., and in 1660, the year of his death, by a treaty with Poland he added still more to the ter. of S. Charles XI., who succeeded, was only four years of age, and his long minority saw the wasting of the resources of S. by an effete nobility. Yet Charles himself proved to have inherited the military genius of the Vasas. When he assumed the crown he fought a series of wars by which he was able to preserve intact the ters. of S., and then turned his attention to domestic reform. He curbed the power of the nobility, and left S. reformed and restored at his death in 1697. Charles XII., the wonder of Europe, succeeded. He spent the twenty years of his reign in almost constant war-

of fulfilment even by a military genius of his calibre. In the end he was clearly defeated and his death probably alone saved S. from utter disaster. During the next fifty years, under the rule of Ulrika Eleonora (d. 1720) and Frederick (d. 1751), much of her ter. was ceded to Hanover, Prussia, and Russia. She could no longer be regarded as a first-class power. The eighteenth century witnessed in S. a great struggle between rival factions for constitutional monarchy, which was won by the constitutionalists in 1723, when the king gave up much of his prerogative. But this reform was carried to extremes; party quarrels between the 'Caps' and the 'Hats' (q.v.) were frequent and bitter, and the state of the country quickly became practically anarchic. Gustavus III. restored the monarchical constitution by a *coup d'état*, but of the type of a limited

monarchy. Gustavus also raised the prestige of the nation by his successful wars with Russia and Denmark. He was assassinated in 1792. In the reign of his son, Gustavus IV., practically all the foreign possessions of the country were lost to Russia and Prussia. In 1809 Gustavus IV. was deposed. His uncle, who succeeded as Charles XIII., was infirm, and to secure the goodwill of Napoleon the *Riksdag* accepted Napoleon's marshal, Bernadotte, as Crown Prince Charles John. He took over the gov., but did not further Napoleon's ambitions against England and Russia. He became a truly national Swedish king. He made war on Denmark to secure Norway, and then later invaded Norway, whose union with S. was confirmed by the great powers in 1814.

In 1819 Charles XIII. died, and Bernadotte succeeded as Charles XIV., initiating the dynasty which still rules S. His son Oscar I., who reigned from 1844 to 1859, introduced democratic reform, especially in industrial organisation. In the reign of Oscar II. (1872-1907) Norway seceded from S. (1905), a peaceful settlement being made at Karstad. Oscar II. died in 1907, and was succeeded by his son Gustaf (Gustavus) V. (b. 1858) during whose reign democracy has been further extended, social services introduced or expanded, and a universal franchise introduced. The acknowledgment of the growth of party politics dates from the dissolution of the union with Norway. Industrialisation had encouraged the growth of socialism, which, however, has always been of a very moderate nature in S., since much of the Socialist vote is derived from rural areas, attracted to it by its theories of co-operation and social security rather than by its fundamental doctrines. Previous to 1905 cabinets were formed from higher civil servants. The first party administration was Liberal. From 1906 to 1911 a Conservative Cabinet under Lindman introduced universal franchise for men and proportional representation. In Feb. 1914 a coalition cabinet under Hammarskjöld was formed. This directed Swedish policy during most of the First World War, S. maintaining a strict neutrality. In 1917 a Liberal-Socialist Coalition introduced a universal franchise and imposed an eight-hour working day. In 1920 S. entered the League of Nations. In the 1920s party politics were irritated by the prohibition question, which completely split the Liberals and divided many of the left-wing sympathisers. There was a series of different gov's. The problem of unemployment helped to increase the prestige of the Social Democrats. Total prohibition was rejected in 1922 and a liquor control system enforced which had some success in the rural dists. Labour problems became less acute in the 1930s.

By this time defence had become a major political issue. In 1935 the Swedish National Defence Commission recommended the creation of a strong modern air force, besides a replacement

programme for the navy at a cost of 50,000,000 kronor over a period of ten years. The preservation of her neutrality was S.'s dominant problem. In 1939 S. rejected the offer of a pact of non-aggression made by Germany, preferring strict neutrality and a greatly increased expenditure on defence. When Russia threatened Finland S. grew alarmed, and joined with Denmark and Norway in representations to Russia on the subject of Finnish independence; and when Russia invaded Finland S. showed her sympathy by opening her frontiers to Finnish refugees and enrolling volunteers. The gov. had to abandon the idea of a defensive alliance with the other Scandinavian countries owing to the opposition from both Russia and Germany. When the Gers. made a demand for the transit facilities for troops and supplies through S. in 1940 the *Riksdag* secretly complied, but S. really had no choice in the matter. The Swedish Prime Minister, however, rejected Germany's invitation to S. to join its 'New Order' (q.r.). In economic matters S. maintained a close association with Germany, especially in exchanging iron ore for coal. The Swedish Gov., however, continued to reinforce the national defences. Throughout 1943 S. continued to remain on friendly terms with all the belligerents, though public opinion was largely pro-Brit., especially after the occupation of Norway and Denmark by Germany. In 1943 the gov. obtained Germany's consent to the cancellation of the transit agreement, and transport of Ger. material and military personnel through S. ceased. In Sept. 1944 the Swedish Gov. announced that all Swedish Baltic ports and waters would be closed to foreign shipping, owing to the new situation in the Baltic produced by the Russo-Finnish armistice of that year. This meant virtually the stoppage of Swedish-Ger. trade for the duration of the war.

Since the end of the Second World War S. has shown a greater willingness to co-operate with other Scandinavian and W. European countries on subjects of economic and defensive importance; but fear of Russia's attitude, and a general acknowledgment that S. has successfully maintained, with favourable results, a complete neutrality during the last two world wars tends to influence S. against committing herself irrevocably to any W. bloc. In 1946 the coalition gov. which had directed the state during the most dangerous war years resigned. In the elections which followed the Social Democrats were again returned as the largest single party, Liberal gains being made chiefly at the expense of the Conservatives.

*Language and Literature.*—Swedish is an important member of the group of Scandinavian languages (q.r.). With the exception of about 35,000 Finns, about 10,000 Lapps (inhabiting the extreme N. of the country), and some thousand speakers of other languages, the pop. of S., numbering about 7,000,000, speak Swedish. This language is also spoken, however, in



W. and S. Finland and the Åland is. (by about 375,000 people), by about 100,000 people in Norway, Denmark, and other European countries, about 675,000 in the U.S.A., about 30,000 in Canada, and about 15,000 in other countries; there are thus about 7,700,000 speakers of Swedish. It was formerly spoken in various Baltic provs. (Estonia, Livonia, Courland, etc.), and in some parts of Russia.

There are four periods in the hist. of the Swedish language: archaic or common Scandinavian (800-1225); classic (1225-1375: important literature; the earliest extant document of c. 1250, is a fragment of *Västgötalag*); middle Swedish (1375-1525: mainly religious literature); and modern Swedish, which begins with the Lutheran reform (trans. of the N.T., 1526, and other writings of Olaus Petri (1493-1552): the most important early literary work written in modern Swedish is the Bible of Gustavus I., 1541. The language was partly revised in 1906. The two prin. forms of Swedish are the *rikspråk*, the written language commonly employed by all Swedes, and its spoken form, the *rikstalspråk*, used by cultured people. A simpler spoken form is the *latspråk*.

The literature of S. was comparatively late in developing. The *Runes* which have been preserved on the many so-called rune stones from the early Middle Ages have great historic and archaeological interest, but cannot be regarded as literature in the real sense. The greatest medieval figure in both the religious and literary hist. of S. is St. Birgitta or Bridget (1303-73), whose mystical visions (*Revelationes*) were pub. in Lat. The virtual beginnings of Swedish literature can be traced to the period when S. began to take a really active part in European politics. The trans. of the Bible into the vernacular during the Reformation period by, among others, Olaus Petri the Reformer (1493-1552), one of the masters of the Swedish language, and a thor of religious works, dramas, and the first critical historical writings in Swedish, and his brother Laurentius Petri (1499-1573), the first Lutheran bishop, fixed the Swedish language for centuries. In the seventeenth century Georg Stiernhielm (1598-1672), the most important author of the time and a versatile and learned man, was the first in S. to make use of the classical verse metres. He wrote works of many different kinds, the best known being the long allegoric and didactic poem *Herkules vid Skiljovägen* ('Hercules at the Crossroads'). A good picture of seventeenth-century life is given in the long anonymous poem *Bröllopsbesvärar inihukommelse* ('Remembrance of Matrimonial Tangles').

In the first half of the eighteenth century the influence of Eng. authors, Steele, Addison, Defoe, Swift, and Pope, was very strong. Steele and Addison, especially, with their moralising jigs, were imitated, notably by Olof von Dalin (1708-63) in his *Then Swanska Argus*. Dalin also pub. many other works, among them historical writings and allegorical poems. A distinct place in the literature of the

eighteenth century is held by the great mystic Emanuel Swedenborg (1688-1772) (*q.v.*). About the middle of the century a group of poets was active, among them Hedwig Charlotta Nordenflycht (1718-1763), Gustaf Philip Creutz (1731-85), Gustaf Fredrik Gyalenborg (1731-1808), and, a little later, Johan Gabriel Oxenstierna (1750-1818). At the end of the century Fr. influence became very strong in S., as in the rest of Europe, and is shown in the works of poets like Johan Henrik Kellgren (1751-95), editor of the widely read *Stockholms-Posten* and the most influential literary figure of the time; Carl Gustaf Leopold (1756-1829); and many others. This period has been regarded as the golden age of Swedish literature, largely because of the patronage of King Gustaf III. (1746-92, ascending the throne in 1771), who was greatly interested in literature, the theatre, and science. A special position is held by Carl Michael Bellman (1740-95), whose songs with Stockholm motifs are characterised by an incomparable vividness and directness, and are popular even to-day. An interesting personality with original philosophical conceptions was Thomas Thorild (1759-1808). About the beginning of the nineteenth century the Romantic movement was very strong in S. as a result of influence both from England and Germany. Per Daniel Amadeus Atterbom (1790-1855), with his long verse dramas, was prominent among the Romantics. The foremost poet of the period was the mystic Erik Johan Stagnelius (1793-1823), one of the greatest masters of the Swedish language. A reaction against the more metaphysical trend of the Romantic movement was represented by the authors belonging to the so-called Gothic Union (*Gotiska Förbundet*) which had as its purpose the revival of the old hist. of the country and the national spirit after the loss of Finland to Russia. Members of this union were Esaias Tegner (1782-1846), one of the greatest personalities in Swedish cultural hist.; he was univ. prof. in Gk., a bishop, and the author of many poems, among them the well-known epic *Prilofs saga* (1825), to-day remembered also for his letters to his friends; and Erik Gustaf Geijer (1783-1847), poet, thinker, and historian, an intellectual leader of his time. Swedish literature in Finland in the middle of the century had a great poet, Johan Ludvig Runeberg (1804-77), whose influence in S. has been considerable, and whose epic works, such as *Fänrik Ståls Sägner* (1848, 1860), about the Swedish-Russian war 1808-9, became a national treasure in Finland. The novel developed towards the middle of the nineteenth century in all its aspects, historical, social, and romantic, owing a great deal to the Eng. influence of Scott and Dickens. A well-known novelist, remembered also as the pioneer of the Swedish feminist movement, was Frederika Bremer (1801-1865). A certain neo-romanticism in poetry appeared in the sixties, exemplified by Carl Snoilsky (1841-1903), with his *Svenska Bilder* (1886), a collection of

historical poems, and his songs from Italy. A central position in the cultural life of the time was held by Abraham Viktor Rydberg (1828-95), novelist, poet, a protagonist of liberal idealism and modern Bible criticism. Naturalism, not so pronounced in S. as in France, to-day mostly called the literature of 'the eighties,' was also of course characterised by social and moral criticism. Most outstanding representative of this movement was August Strindberg (1849-1912) (q.v.), the greatest genius of Swedish literature. He was also the most versatile of all Swedish authors. He wrote outstanding novels, such as *The Red Room* (1879, trans. 1913), the autobiographical *Son of a Servant* (1886-87, 1909, trans. 1913), short stories such as *Swedish Lives and Adventures*, poems, and above all dramas. He was one of the creators of the modern theatre. Among his naturalistic plays may be noticed *The Father* (1887, trans. 1907) and *Miss Julie* (1888, trans. 1911), and among his symbolic ones the trilogy *To Damascus* (1898-1904, trans. 1933-35) and *The Dream Play* (1902, trans. 1912). In the nineties he changed his naturalistic, socialistic, and Nietzschean attitude, and developed later a kind of individualistic Christianity. The reaction against naturalism set in about 1890 with a group of authors ('the nineties,' a parallel movement to the symbolist one in France), among them being Verner von Heidenstam (1859-1940), poet, and author of historical and romantic novels; and Oscar Levertin (1862-1906), who had, and still has, a great influence as a critic. To the group belonged two of S.'s finest poets, Gustaf Fröding (1860-1911) and Erik Axel Karlfeldt (1864-1931). Also contemporary was Selma Lagerlöf (1858-1940), with her world-famous romantic novels and tales, such as *Gosta Berlings Saga* (1891, trans. 1898), and her book about S. for children, *The Wonderful Adventures of Nils* (1906-7, trans. 1907). During the first decade of this century appeared many representatives of the modern realistic novel. The foremost author is Hjalmar Söderberg (1868-1911), ironical sceptic and a fine stylist. Others include Sigfrid Siwertz (b. 1882), also active as a dramatist, Gustaf Hellström (b. 1882), journalist (foreign correspondent in Great Britain), and author of partially autobiographical novels; and Elin Wagner (1882-1949), the leading woman author. Typically Swedish was the great humorist Albert Engström (1869-1940), important both as author and artist. The great literary genius of this century is Hjalmar Bergman (1883-1951), with his novels characterised by a bizarre fantasy and a profound psychology. Of the later generation, Par Lagerkvist (b. 1891) is of very great importance. Active as novelist, poet, and dramatist, he expresses an original philosophy of life. Among the poets of this century may be mentioned Bo Bergman (b. 1869), Vilhelm Ekelund (b. 1880), Anders Österling (b. 1884), Birger Sjöberg (1885-1929), Hjalmar Gullberg (b. 1898), Karin Boye (1900-41), Gunnar Ekelöf (b. 1907), Karl Vennberg

(b. 1910), Erik Lindegren (b. 1910), and Harry Martinson (b. 1904), who is also important as a prose writer. He belongs to the large group of authors who originate from the working class and are self-taught. Other prominent representatives of this group are Eyvind Johnson (b. 1900), Jan Fridegård (b. 1897), and Vilhelm Moberg (b. 1898). Totally apart from these stands Agnes von Krusenstjerna (1894-1940), with her great novel series of the higher circles of society. Special positions in recent literature are held by Frans G. Bengtsson (b. 1894), with his humorous novels and his biography of Charles XII., also a masterly hand at the essay in its classic Eng. form, and by Tage Aurell (b. 1895), most important among the new authors with his impressive short novels. To the younger generation belong Sivar Arner (b. 1909) and Stig Dagerman (b. 1923).

**Art.**—The first outstanding Swedish painters appeared in the eighteenth century. These included portrait painters such as Carl Gustaf Pilo (1711-93), Alexander Roslin (1718-93), and Carl Fredrik von Breda (1759-1818), a pupil of Reynolds, best known for his portrait of Gainsborough. A new flowering occurred towards the end of the nineteenth century, when Konstnärsförbundet (the Artists Association) had a strong influence on Swedish art. Its members were Fr.-inspired and strong opponents of the more academic trend of art represented by the Academy of Fine Arts. The most important painters of this generation were Ernst Josephson (1851-1906) and Carl Fredrik Hill (1849-1911). Others included Karl Nordström (1855-1923), the leader of the group, Carl Wilhelmson (1866-1928), Anders Zorn (1860-1920), Prince Eugen (1865-1947), Carl Larsson (1853-1919), Bruno Liljefors (1866-1939), and Helmer Osslund (1866-1938). These painters had studied in France, but they created a national style, some in a more realistic, others in a more romantic way. In the decades before and after the new century three very original painters were active: Olaf Sager-Nelson (1868-96), Ivar Arosenius (1878-1909), and Ivan Aguéli (1869-1912). Painters in this century have also been influenced by France, especially by Matisse, Cézanne, and Gauguin. Here may be mentioned Karl Isakson (1878-1922), Leander Engström (1878-1922), Gosta Sandels (1887-1919), Nils von Dardel (1888-1943), Isaac Grünewald (1899-1946) and his wife Sigrid Hjerten (1893-1948). Most prominent among 'naïvists' influenced by native art are Hilding Linnqvist (b. 1891), Axel Nilsson (b. 1885), and Sven Erixson (b. 1899). Among the free colourists of the Göteborg school may be mentioned Carl Kulberg (b. 1878), Ivan Ivarson (1900-39), Inge Schiöler and Ragnar Sandberg (b. 1902). Anders Zorn and Axel Fridell (1894-1935) have done fine etchings.

S. has only recently produced any sculptors of note, with the exception of Johann Tobias Sergel (1711-93) whose work is well known. Besides Carl Milles (b.

1875) may be mentioned Carl Eldh (*b.* 1873) and the modern nationalist Eror Hjorth (*b.* 1894).

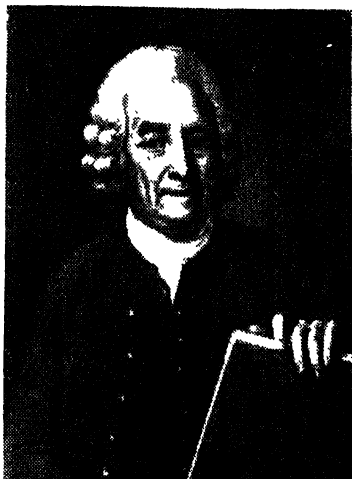
Swedish architecture belonging to the Middle Ages has survived in a number of her churches and cathedrals. It is distinguished by its clear-cut lines and richness of sculptured detail. With the advent of the twentieth century came a revival of Swedish architecture based on traditions of the Vasa renaissance. The climax of this movement was the style of Ragnar Östberg (1866-1915), designer of Stockholm's city hall, built in the twenties, also a product of a new Romanticism. A tendency of reviving the neoclassicism from the beginning of the nineteenth century was also strong at this time. Functionalism burst into full bloom with the Stockholm Exhibition of 1930, the architect for which was Gunnar Asplund (1859-1940). Contemporary architecture is still dominated by this trend for the practical as well as the beautiful in homes and industrial and public buildings.

*Music.*—From medieval church chants and age-old folk melodies, of which a very great number has been preserved, Swedish music progressed rapidly in the seventeenth and eighteenth centuries. In the eighteenth century Johan Helmich Roman (1694-1758), 'the father of Swedish music,' appeared with his choral and orchestral works. Swedish composers are undoubtedly headed by Franz Berwald (1796-1868); the most 'national' composer was August Söderman (1832-76), originator of the romantic style later elaborated by such composers as Hugo Alfvén (*b.* 1872), Wilhelm Peterson-Berger (1867-1942), and Wilhelm Stenhammar (1871-1927). Chief among present composers of national romantic music are Ture Rangström (1884-1917), Kurt Atterberg (*b.* 1887), Adolf Wiklund (*b.* 1879), and Götzfrid Kallstenius (1861-1943). Swedish music took a modern form with Hilding Rosenberg (*b.* 1892) and Gösta Nystroem (*b.* 1890), two important and versatile composers. They are followed by Dag Wirén (*b.* 1905), Gunnar de Frumerie (*b.* 1908), and Lars-Erik Larsson (*b.* 1908). Among the younger generation may be mentioned Karl-Birger Blomdahl (*b.* 1916), Ingvar Lidholm (*b.* 1921), and Sven-Erik Back (*b.* 1919).

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**Swedenborg, Emanuel** (1688-1772), Swedish scientist, philosopher, and theologian, *b.* at Stockholm, eldest son of



National Museum, Stockholm

EMANUEL SWEDENBORG

The painting by P. Krafft the Elder

Jesper Swedenborg, Lutheran bishop of Skara. The family was ennobled in 1719 and assumed the name S. in accordance with custom. S. is so generally known as a theologian of heterodox views which have found acceptance by the New Church, sometimes called 'Swedenborgian,' that it is seldom appreciated that he was one of the foremost scientific minds of his day and had gained a European reputation for science and philosophy before he ever turned to theology. Some of his conclusions have a surprisingly modern sound, and the wide range of his mind over all the known branches of science is comparable only with that of da Vinci.

As a young man he was employed by Charles XII. in civil and military engineering works, and was appointed assessor of the Royal College of Mines, in which office he gave valuable service to the metal industries of Sweden during thirty years.

S. declined a professorship of mathematics on the ground that his interests were in the practical applications of science. With the pub. in 1734 of his *Opera philosophica et mineralia*, and in the same year of a smaller work on *The Infinite*, and the *Final Cause of Creation*, his reputation as a philosopher of the first rank was estab. throughout Europe. At about this time he began his researches into the nature of the soul, and applied himself to anatomy and physiology, in which field he is considered the first to point out that the motion of the brain synchronises with that of the lungs rather than of the heart. His prin. pub. in this period were *Oeconomia regni animalis* (1740-41) and *Regnum animale* (1744-45). About this time, however, S. turned away from the active pursuit of scientific interests and began to write in what was, for him, the new field of theology, believing himself to have received a direct revelation. In 1749 he pub. the first vol. of *Arcana Coelestia*, and from then until 1711 when the *True Christian Religion*, a vol. of systematised theology, was pub., his pen was busy with divine themes.

His system of theology presents Christ not as the second person of the Trinity, but as the one God, the whole Trinity being in Him as soul, embodiment, and operation. Redemption consisted in the conquest, in the human, of temptations from all the hells and the subsequent control of the hells by the divine human. S. asserts that the word of God has an internal or spiritual meaning throughout, and the *Arcana Coelestia* consists of a detailed exposition of the 'spiritual sense' of Genesis and Exodus, and incidentally of many other parts of Scripture. The *Apocalypse Revealed* (1766) and the posthumously pub. *Apocalypse Explained* deal similarly with the Book of Revelation. In the former work he declares that the Holy City, New Jerusalem, signifies a new 'Church' or dispensation of truth then being effected through these revelations.

**Swedenborgians**, term sometimes, but inaccurately, applied to the members of the organisation known as the New Jerusalem Church, or New Church, who believe that the theological works of Emanuel Swedenborg (a.r.) are a divine revelation containing the doctrines of the New Church signified by the New Jerusalem in the Apocalypse. There are two branches of the New Church in Great Britain, the General Conference of the New Church and the General Church of the New Jerusalem. The first public association of New Church people took place in 1788 in Great Eastcheap, London. At the present time there are about 6000 New Church people in Great Britain and over sixty places of worship.

**Swedenborg Society (Inc.)**, The, in London, instituted in the year 1810 and incorporated under the Companies Act in 1925. Its main objects are to print, publish, sell, and distribute the theological works of Emanuel Swedenborg (a.r.), in the original Lat. and trans. into

Eng. and other languages. The society has pub. works in Jap., Hindu, Tamil, Arabic, and Zulu, as well as in all the prin. European languages, and in Braille. It co-operates with the Amer. Swedenborg Scientific Association in publishing Swedenborg's scientific works. The society maintains reference and lending libraries, where all the prin. works are available; the reference library also contains reproductions of all the Swedenborg MSS. extant, and the archives are a valuable collection of some 1600 items. Membership of the society, which is entirely non-sectarian, is open to all those interested in its work.

**Swedish Movements**, see under GYMNASTICS.

**Sweepstakes**, gaming transaction, in which one person wins (sweeps) the stakes of himself and others; or a prize in a horse-race made out of sev. stakes. S. are lotteries, and therefore illegal. See also CALCUTTA SWEEPSTAKE; GAMBLING; LOTTERY.

**Sweet Bay**, see LAUREL.

**Sweetbread**, name given to certain glands of animals used as food. The pancreas of the ox or calf is most generally employed; it is palatable and digestible when well cooked, and is more especially suited for invalids. The term S. is also used for testes and for thymus gland.

**Sweet Briar**, see ROSE.

**Sweet Cicely**, see MYRRIS.

**Sweet Corn**, see under MAIZE.

**Sweet Gale**, see BOD MYRTLE.

**Sweet Marjoram**, see MARJORAM.

**Sweet Pea** (*Lathyrus odoratus*), probably the most popular ann garden plant. It is a typical member of the family Leguminosae, sub-family Papilionaceae. The large petal at the back is the standard, the two wings are lateral, and in front is the keel formed from two partly fused petals. There are ten stamens, nine fused and one separate. The carpel is single, with a row of ovules. It lends itself exceptionally to hybridisation, and indeed was, with the edible pea, the subject of Mendel's invaluable experiments (see MENDELISM; GENETICS). Its original habitat was Sicily. Its numerous varieties cover a very extensive range of colour, though deep blue and most shades of yellow were unknown before 1913. The ground should be well prepared for plants by deep digging, and the seed can be either sown where the plants are to bloom or preferably under glass early in the year, the seedlings being planted out with a good ball of soil and roots about mid April. Support by means of tall sticks or strings should be given early, and when flowering starts liberal supplies of water and liquid manure and also regular picking of the flowers will prolong the blooming period and increase the beauty of the blooms. The National Sweet Pea Society has its offices at Bedford Chambers, Covent Garden, London.

**Sweet Potato**, species of Convolvulaceae allied to the morning-glory and known as *Ipomoea Batatas* (or *Batatas edulis*). It is a native of warm countries, where its tuberous roots are eaten as potatoes.

**Sweet William**, or *Dianthus barbatus*, perennial herb of the family Caryophyllaceæ, a native of E. and S. Europe, often grown in Brit. gardens on account of its bright flowers.

**Swellendam**, cap. of a co. of the same name, in Cape Prov., S. Africa, near the Breede R., 30 m. W. of Heidelberg. The first S. African republic was estab. here, in 1795. Wheat and wool are produced. Pop.; European 2150, coloured 1600.

**Swidnica** (Ger. *Schweidnitz*), tn. of Polish Silesia, on R. Weistritz, 36 m. S.W. of Breslau. The cap. of a principality, 1278-1386, it was the scene of a Swedish victory, 1642. There are sugar refineries and watch factories. Pop. 34,400.

**Swiebodzin**, see SCHWETZINGEN.

**Swietenia**, Mahogany, see MAHOGANY.

**Swietochlowica** (Ger. *Schwientochowitz*), tn. of Polish Silesia, 2 m. W.S.W. of Królewska Huta (Königs-hütte). It has iron foundries and coal-mines. Pop. 23,200.

**Swift, Jonathan** (1667-1745). Brit. satirist and writer, b. in Dublin, of Eng. origin. He was educated at Trinity College, Dublin, and in 1692 became secretary to Sir Wm. Temple. He hated his subordinate position, and finding that Temple made no effort to procure him advancement, he went to Dublin in 1694, was ordained, and given the prebend of Kilroot. Securing no church preferment, S., two years later, returned to his old duties at Moor Park, where young Esther Johnson ('Stella') was now installed as a member of the household. He remained there until Temple's death (1699), when he went to Ireland, and received some minor clerical appointments. He had read deeply, and already in 1697 had written *The Battle of the Books*, which with the still more famous *The Tale of a Tub* was pub. in 1704. When he came to England in 1705 and 1707 he made the acquaintance of the leading men of letters and statesmen, and gradually became a power with the Tory ministers. A love-affair with Miss Vanhomrigh ('Vanessa') is related in the poem *Cadenus and Vanessa*, but it was 'Stella' who had the first place in his heart, and his *Journal to Stella* makes very delightful reading. Whether he married her or not is unknown. In 1713 he was appointed to the deanery of St. Patrick. He wrote many political pamphlets, the most famous of which are the *Drapier Letters* (1724). *Gulliver's Travels* was pub. in 1726. His last visit to England was paid in the following year, and the rest of his life was spent in Ireland. His brain became overclouded in 1740, and he never recovered. He died in Oct., and was buried beside 'Stella' in his cathedral. The clarity of his prose style and his manipulation of language have been the example for succeeding Eng. writers, and his mastery of irony, which in literature is associated with his name more than any other, has never been surpassed. His satire remains to-day as alive as when it was written, because, although S. played a powerful part in party politics, his indictment of social customs and, in

*Gulliver's Travels*, of the whole human race was inspired by a sincere moral indignation and a humane desire to work for the betterment of mankind. His fundamental teaching is all to be found in *Gulliver's Travels*. In all four parts of the book the theme is that of man's betrayal of his own reason, his frustration through the folly, vanity, violence, and brutishness which distort his values and cloud his judgment. Among his minor works are *A Meditation upon a Broomstick* (1710); *Predictions for the Year 1708*, by 'Isaac Bickerstaff, Esquire'; *An Essay on Conversation* (c. 1709-10); and *A Complete Collection of Gentle and Ingenious Conversation* (1738). There is an ed. of his works by Sir Walter Scott (1814), and



JONATHAN SWIFT  
Engraving by B. Holl

the *Correspondence of Jonathan Swift* (4 vols.) was ed. by F. Elrington Ball (1913). See lives and studies by Sir H. Craik, 1882; Sir L. Stephen, 1925; C. van Doren, 1931; R. V. Jackson, 1939; A. E. Case, 1946; and B. Acworth, 1948; also Lewis Gibbs, *Vanessa and the Dean*, 1938, and Evelyn Hardy, *The Conjured Spirit Swift. A Study in the Relationship of Swift, Stella, and Vanessa*, 1950.

**Swift**, name of members of the Picarian family Cypselidae closely allied to the nightjar, cuckoo, and woodpecker, but not to the swallow, which it resembles superficially. The only Brit. species (*Cypselus apus*) arrives in Britain in May, leaving in Aug. for its winter quarters. It feeds entirely on small winged insects, and in its search for them exhibits remarkable powers of flight. It nests in holes in tall buildings, laying two or three large white eggs. The adult bird is about 7 in. long. The plumage is blackish brown, except for a small greyish white patch under the chin. The tail is long and forked. An occasional visitor to Britain

is the white-bellied or Alpine S. (*C. melba*). A remarkable S. is Salvin's S. (*Panytila sancti-hieronymi*), a native of Guatemala, which builds a huge nest composed entirely of seeds and the bird's own salivary secretion. See also NESTS, EDBLE.

**Swilly**, Lough, inlet of co. Donegal, Eire, entering from the Atlantic between Fanad Point and Dunaff Head (4 m. in width) and extending inland for 25 m.

**Swimming**, art of propelling oneself through water without artificial aid. Swimming is for man an acquired art, i.e. certain movements which are not instinctive, at any rate among civilised peoples, have to be learnt and practised before the aspirant can expect to support himself in the water. The density of the human body is approximately 98, which means that in water approximately forty-nine-fiftieths of the human body is immersed and that the water will support one-fiftieth of body in air, i.e. the top and back part of the head, from eye level to the base of the skull. More than one-fiftieth may be supported by inflating the lungs, especially the lower part (diaphragmatic breathing). This allows the arms to be lifted into the air for recovery movements following propulsive movements in the water. Modern swimmers use four prin. strokes: breast, crawl, back crawl, and butterfly. The Eng. backstroke, side, overarm, and trudgeon have been dropped for speed swimming. Modern methods of teaching are not confined to one stroke only. As watermanship and early training are progressing, the fundamentals of each stroke are introduced. If crawl stroke is taught, as having limb movements akin to walking and climbing, it may be difficult to acquire breast stroke, which is essential for life-saving at a later stage.

**The Breast Stroke.**--Arm, leg, and breathing is taken to four counts from the 'ready' position: body in prone position, arms extended beyond head, thumbs touching; legs extended and together; head lowered so that the water-line crosses face just below eye level; the whole body is relaxed. Count 1: the arms straight and tensed, with hands cupped and turned slightly outwards, are swept downwards and outwards to a position where there is not more than 90° angle between them. The head is raised and breath inhaled through the mouth. Count 2: arm muscles relax, elbows bend slightly, and hands swing towards each other to assume a position, with palms downward, a little in front of the chin. The legs, relaxed, are bent, with heels touching and knees outwards so that there is a diamond shape between them. The head is lowered to eye level in the water. Count 3: the arms, still relaxed, are stretched forward to the 'ready' position. The legs are vigorously straightened and swirled together to the 'ready' position. The breath is exhaled forcibly through the mouth and nose, into the water. Count 4: the whole body is lying horizontally in the water, without strain, and is gliding forward as a further exhalation of the breath takes place, and as a result of the forward

momentum imparted by the leg propulsion movement of count 3.

**The Crawl Stroke** is the most generally used in free-style S. over all distances. The body lies prone with the lower part of the face in the water, as in the 'ready' position previously described for breast stroke. The legs, relaxed, are worked from the hips, up and down, with slight flexion of knees and with as much ankle play as possible. The heels only break the surface on the up-drive. Toes are turned inwards to increase power of drive. While the number of 'beats' may vary from six to twelve, the commonly accepted rhythm is the 'six beat,' i.e. six movements of legs up and down to one complete cycle of the arms. The legs provide propulsion as they approach each other; the feet sink to a depth of 15-18 in., and the legs pass close to each other on the centre line of the body. The arms propel alternately with regular rhythm, one arm propelling as the other arm is recovering. The hand slightly cupped, fingers together, enters in advance of the head on its own side of centre-line. It presses down on the water with elbow slightly bent and is driven towards the thigh ready for recovery. The elbow is lifted to break the water surface, and the forearm, hanging loose, is carried forward in a half-circle over the water to the starting position. Unilateral (one-sided) breathing is used by most swimmers. The head is turned, once in each complete stroke, to the left or right. If to the right, the head is turned to bring the mouth clear of the water to inhale, as the left arm has commenced its downward drive. The head is turned for the eyes to look forward again, as the recovering right arm has reached head level. Bilateral or two-sided breathing is that employed when the swimmer inhales alternately left and right. It is used by some speed swimmers to preserve body balance in the water. The head is turned to the right to inhale while the left arm pulls, and the head to the front to exhale during the pull of first the right arm and then the left arm. The next intake of air occurs as the head is turned to the left during the pull of the right arm and the head is centred again to exhale. In this way inhalation takes place with each third arm stroke, whereas the swimmer using unilateral breathing inhales with every other arm stroke. In both cases exhalation takes place by forcibly expelling air through mouth and nose, into the water.

**The Back Crawl Stroke** has a similar leg action to the crawl stroke, with the body in the supine position, hips slightly bent, and head raised so that the swimmer may watch the toes at water level. The legs sink to a depth of 12 to 18 in. The arms execute a cycle of movements, alternately, propelling and recovering on a similar principle to crawl stroke. The arm is flung clear of the water, outwards and backwards until the hand touches the water, ahead of the shoulder line, with cupped hand slightly downward into the water. It is then pulled through the

water, downwards and upwards to the side of the body. Breath is inhaled as one arm is flicked out of the water and exhaled throughout the remainder of the cycle.

The *Butterfly Stroke* is best described as the breast stroke leg action with a simultaneous crawl arm action, i.e. both arms pulling together and recovering together. Since both arms recover *out of the water*, the body must be riding higher than in the ordinary breast stroke; hence the effect of the leg kick must be felt a fraction of a second earlier. There is no 'glide' as in the breast stroke count four. Remarkable times have been secured with this stroke, which was used by all but one finalist in the 1948 Olympics Games breast stroke (men). There is much to be learned yet about this stroke, as to timing and effective leg drive. To conform to the rules for breast stroke competition S., the legs must bend at the same time and drive outwards and together. Crawl stroke leg action may not be used. It is advisable to learn breast and crawl strokes well before attempting this stroke.

The *Plunge* is no longer a championship event at national or international meetings, but it is very useful to obtain a flying start in a race. The swimmer stands on the edge of the bath with toes gripping the edge; bending forward from the hips and bending the knees, the arms are swung forward and the legs straightened with a vigorous push so that the arms, trunk, and legs are stretched in a straight line and the head between the arms. Thumbs should be touching. Entry into the water is clean and well away from the bath; the plunge is finished with a long glide. In competitions there was a time limit of 60 sec. set as a maximum for breath being held, when the distance travelled from the take-off point was measured.

*Diving*.-- The racing dive is very similar to the plunge, except that the glide is reduced and the leg action of the stroke is taken up on entry into the water, the arm action following to complete the full stroke. There are two types of diving, spring-board and firm-board, with heights for the latter increasing up to 10 metres. Of the firm-board diving, the Eng. 'header' is the most useful accomplishment for the ordinary swimmer, and it may be carried out from the side of the bath. The erect position on the side is taken, toes gripping the edge. The eyes look straight forward, the arms hanging straight and close to the sides with fingers slightly curled, and the weight of body evenly distributed on both feet, which may be slightly apart. When the body is balanced well, the arms are raised forwards and upwards to the level of the shoulders, and kept the width of the shoulders, with palms down. For the take-off, the arms are swung downwards and slightly past the thighs, with the knees bending slightly, and the weight of the body transferred to the balls of the feet. The arms are then swung forward and upwards, and at the same time the knees straighten, and the body, in a straight line from finger-tips to toes, is

directed upwards and outwards, with an angle of about 20° between it and the vertical as the body leaves the bath side. There is no relative movement whatsoever of the body and limbs during the flight through the air. The body rotates on an axis about the base of the chest, due to the effect of gravity, and commences its downward flight. The angle of entry depends on the height of the dive, but should never pass beyond the vertical, and should not be less steep than 30° from the vertical. The whole of the body, from the finger-tips to the toes, passes through the 'hole' in water made by the finger-tips, and is maintained in a straight line until the toes have disappeared beneath the surface. The dive ends, for competitive purposes, at this point, no account being taken of method of returning to the surface or absence of splash. For details of the swallow dive and more complicated movements from the spring-, firm-, and high-boards, reference should be made to the *I.S.A. Manual of Diving* and other books listed below.

*LIFE-SAVING*.--The standard reference book is the *Handbook of Instruction of the Royal Life-saving Society*. As far as actual S. strokes are concerned, the breast stroke is essential for the final approach to the drowning person, since it allows the rescuer to manoeuvre easily and to watch any movements which the person is making. For actual rescues five methods are employed: the first three entail use of the life-saving back kick, to tow the person in a supine position; the fourth method employs the breast stroke to 'swim in' a person who is passive; and the fifth method is for good side-stroke swimmers who can carry the person under one arm. The first three methods employ holds on the drowning person, viz.: (1) holding on each side of the person's face, over the ears, when not struggling; (2) holding by the arms, above the elbows, when struggling; and (3) passing the rescuer's arms under the armpits of the subject and spreading the hands across the subject's chest. In this way a person whose arms are difficult to hold, or who is violent, has his arms 'locked,' and at the same time feels extra support from the rescuer. There is a further and more recently developed method which employs the life-saving back kick, but allows the rescuer one arm free to assist S., the 'unigrip' method. The rescuer passes the left arm over the subject's left shoulder and holds his chin with the left hand cupped to fit in comfortably. At the same time the rescuer's left arm, bent at the elbow, presses the subject's left shoulder against the rescuer's chest. Two methods of restraint can be applied according to the degree of struggling by the subject. In cases where the subject secures a hold on the rescuer there are three accepted methods of release, when held by (1) the wrists, (2) round the neck, and (3) round the arms and body, and a further development when held round the body from behind. In addition the rescuer should be acquainted with surface diving to raise a body from the bottom of a bath,

riv., or the sea, and various methods to land the rescued person at a shallow beach, steep bank, and into a boat. The essential points in effecting a rescue are to avoid waste of time, and to be ready to swim in clothes; to conserve energy wisely; to keep on top of the subject when effecting a release from a hold, and finally to keep the subject's head above water when towing him to safety, thus ensuring confidence and preventing a desire for renewed struggling. A sound knowledge of artificial respiration (*q.v.*) is essential. In conclusion a brief description of the life-saving back kick is necessary. The legs only are used to propel the rescuer towing his subject, both in the supine position. From the starting position with legs together, the legs are dropped from the knees, so as to make an angle of 60° with the horizontal, and the knees open slightly. The legs are then straightened, kicked outwards, and swirled together vigorously. With this stroke the legs are not fouled by the person being towed, and the hands are free to maintain a hold on the subject, or if only one hand is used thus, the other may be employed to obtain added propulsion.

WORLD'S RECORDS (as at Sept. 4, 1950)

**Men. Free style:** A. Ford (U.S.A.) 100 yds., 49.7 sec.; 100 metres, 55.4 sec. J. B. Marshall (Australia) 200 metres, 2 min. 4.6 sec., 220 yds., 2 min. 5.5 sec.; 100 metres, 4 min. 29.5 sec.; 440 yds., 4 min. 31.2 sec. W. Smith (U.S.A.) 880 yds., 9 min. 54.6 sec. H. Furuhashi (Japan) 800 metres, 9 min. 35.5 sec.; 1500 metres, 18 min. 19 sec. J. Medina (U.S.A.) 500 yds., 5 min. 16.3 sec. R. Flanagan (U.S.A.) 500 metres, 5 min. 56.5 sec. K. Nakama (U.S.A.) 1 mile, 20 min. 29 sec. **Breast stroke:** K. E. Carter (U.S.A.) 100 yds., 58.5 sec. L. K. Meshkov (U.S.S.R.) 100 metres, 1 min. 7 sec. L. L. Brawner (U.S.A.) 200 yds. 2 min. 13.1 sec. J. T. Verdeur (U.S.A.) 200 metres, 2 min. 28.5 sec. **Back stroke:** A. Kiefer (U.S.A.) 100 yds., 56.8 sec. A. M. Stack (U.S.A.) 100 metres, 1 min. 3.6 sec.; 150 yds., 1 min. 29.9 sec., 200 metres, 2 min. 18.5 sec. **Relays. Free style:** New Haven S.C. (U.S.A.) 4 by 100 yds., 3 min. 23.8 sec.; 4 by 100 metres, 3 min. 48.6 sec. Yale Univ. (U.S.A.) 4 by 200 yds., 7 min. 48.9 sec.; 4 by 200 metres, 7 min. 43.2 sec. **Relays. Medley (Back, Breast, and Free style):** Michigan Univ. (U.S.A.) 3 by 100 yds., 2 min. 49.1 sec. Dauphin du Toulouse (France) 3 by 100 metres, 3 min. 12.3 sec.

**Ladies. Free style:** G. Andersen (Denmark) 100 yds., 58.2 sec. W. den Ouden (Holland) 100 metres, 1 min. 4.6 sec. R. Hveger (Denmark) 200 metres, 2 min. 21.7 sec.; 220 yds., 2 min. 22.6 sec.; 100 metres, 5 min. 0.1 sec.; 500 yds., 5 min. 53 sec.; 500 metres, 6 min. 27.4 sec.; 800 metres, 10 min. 52.5 sec.; 1500 metres, 20 min. 57 sec.; 1 mile, 23 min. 11.5 sec. A. Curtis (U.S.A.) 410 yds., 5 min. 7.9 sec.; 880 yds., 11 min. 8.6 sec. **Breast stroke:** N. van Vliet (Holland) 100 yds., 1 min. 9.2 sec.; 200 yds., 2 min. 35.6 sec.; 200 metres, 2 min. 49.2 sec. G. Vallorey (France) 100 metres, 1 min. 17.4 sec. **Back stroke:** G. Wiekema (Holland) 100

yds., 1 min. 4.6 sec.; 200 metres, 2 min. 35.3 sec. C. Kint (Holland) 100 metres, 1 min. 10.9 sec.; 150 yds., 1 min. 42.1 sec. **Relays. Free style:** Denmark National Team, 4 by 100 yds., 4 min. 5.7 sec.; 4 by 100 metres, 4 min. 27.6 sec. **Medley (Back, Breast, and Free style):** Holland National Team 3 by 100 yds., 3 min. 19.6 sec.; 3 by 100 metres, 3 min. 42.4 sec.

The Eng. Channel has been swum by the following persons:

(1) M. Webb (Great Britain), 21 hrs. 45 min. (1875); T. Burgess (Great Britain), 22 hrs. 35 min. (1911); H. Sullivan (U.S.A.), 26 hrs. 50 min. (1923); E. Tiraboschi (Italy), 16 hrs. 33 min. (1923); C. Toth (U.S.A.), 16 hrs. 58 min. (1923); Gertrude Ederle (U.S.A.), 14 hrs. 39 min. (1926); Milie G. Corson (U.S.A.), 15 hrs. 29 min. (1926); A. Wierkotter (Germany), 12 hrs. 40 min. (1926); E. H. Tomme (Great Britain), 14 hrs. 29 min. (1927); Mercedes Glantz (Great Britain), 15 hrs. 15 min. (1927); Ivy Hawke (Great Britain), 19 hrs. 16 min. (1928); Hilda Sharp (Great Britain), 14 hrs. 58 min. (1928); I. Helmy (Egypt) 23 hrs. 40 min. (1928); Margaret M. Duncan (S. Africa), 16 hrs. 17 min. (1930); H. Taylor (Great Britain), 14 hrs. 48 min. (1935); T. Blower (Great Britain), 13 hrs. 31½ min. (1937).

(2) G. Michel (France), 11 hrs. 5 min. (1926); N. L. Deham (Great Britain), 13 hrs. 55 min. (1926); Ivy Gill (Great Britain), 15 hrs. 9 min. (1927); Ethel Lowry (Great Britain), 15 hrs. 45 min. (1933); Emma Faber (Australia), 14 hrs. 8 min. (1931); E. H. Tomme (Great Britain), 15 hrs. 54 min. (1931); F. Whetcroft (Great Britain), 13 hrs. 35 min. (1938).

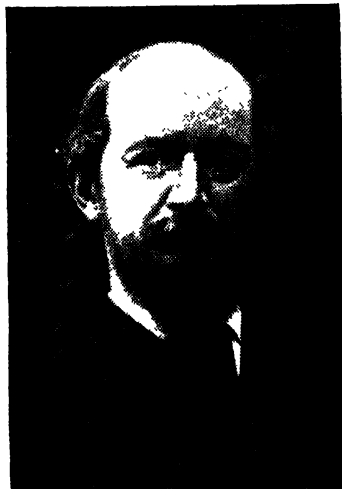
(3) Bruna W. Plarre (Germany), 15 hrs. 33 min. (1938); Sally Bauer (Sweden), 15 hrs. 23 min. (1939); D. Carpio (Argentina), 14 hrs. 46 min. (1947); T. Blower (Great Britain), 15 hrs. 31 min. (1948); H. Abd El Rehim (Egypt), 17 hrs. 38 min. (1948); 15 hrs. 16 min. (1949); and 10 hrs. 50 min. (1950); M. H. Hamad (Egypt), 16 hrs. 40 min. (1949); and 12 hrs. 5 min. (1950); Z. Zarganos (Greece), 18 hrs. 30 min. (1949); and 16 hrs. 17 min. (1950); F. de Moulin (Belgium), 21 hrs. 59 min. (1949); P. Mickman (Great Britain), 23 hrs. 48 min. (1949); Florence Chadwick (U.S.A.), 13 hrs. 23 min. (1950); R. le Morvan (France), 11 hrs. 3 min. (1950); Eileen Fenton (Great Britain), 15 hrs. 31 min. (1950); W. S. Rockett (Great Britain), 14 hrs. 17 min. (1950); W. Barrie (Great Britain), 16 hrs. 18 min. (1950); Jenny Kammergaard (Denmark) 16 hrs. 27 min. (1950).

The Channel Swimming Association accepted the claims of those in section (1). The claims of those in section (2) were deferred for further evidence to be supplied. From 1939 onwards (section (3)) no claims were received.

See P. W. A. Herbert, *Foundations of Modern Springboard Diving*, 1946; D. A. Armbruster, *Competitive Swimming and Diving*, 1947; Winifred Gibson, *To Start you Swimming*, 1947; R. J. H. Kipluth, *Swimming*, 1948; A.S.A. *Swimming Instruction*, 1949; S. G. Hedges *The Complete Swimmer*, 1950.



**Swimming-bladder**, see AIR-BLADDER.  
**Swinburne, Algernon Charles** (1837-1909), Eng. poet, b. in London. He lived as a boy at Capheaton, Northumberland (home of his grandfather, Sir John S. Bt.), and at E. Dene, in the Isle of Wight. In 1852 he went to Eton, and five years later to Balliol College, Oxford, where he remained until 1860. He left without a degree, although in 1858 he won the Taylorian Prize for Fr. and It. While at Oxford he met Rossetti, who had gone there to do some mural paintings and he also met there Burne-Jones and Wm. Morris. It was to Rossetti that S. dedicated his first pub. poetical drama



Press Portrait L.reau  
 ALGERNON CHARLES SWINBURNE

*The Queen Mother* (1860). This, with a similar work, *Rosamond*, was of Shakespearian inspiration, and neither was successful. In 1862, after returning from Italy, where he met Landor S. took a house in Chelsea with Rossetti, Wm. Rossetti, and George Meredith; three years later S. pub. two much more successful poetic dramas, *Atlanta in Calydon* (1865), and *Chastelard* (1865). In 1866, his *Poems and Ballads* provoked scandal and a storm of abuse from the critics who were repelled by the sensuality which they declared characterised its pages. However, S. had made his name as a writer, and from then on produced a great number of poems and poetic dramas, and also sev. critical essays, the best of which include *William Blake* (1868); *Essays and Studies* (1875); *Erechtheus* (in the form of classical tragedy) (1875); *A Study of Shakespeare* (1880); *Victor Hugo* (1886); *Studies in Prose and Poetry* (1891); and *The Age of Shakespeare* (1908). His life itself was uneventful; he identified him-

self with the Pre-Raphaelite movement, and enthusiastically upheld the cause of It. independence. In 1879 he moved to Putney, where he took a house with Theodore Watts-Dunton, and there he lived until his death on April 10, 1909. Louis Cazamian writes of him (1927): 'A very considerable poet, Swinburne is yet not the centre of his literary age. He lacked, to be such, the determination and sureness of instinct. Half transformed as it is by the aesthetics of symbolism, his art still remains involved in Romanticism pure and simple. . . . So completely does he surrender to the intoxication of language that his inspiration very often seems to follow no other guidance.' See W. M. Rossetti, *Swinburne's Poems and Ballads*, 1866; and lives and studies by T. Wratistlaw, 1900; E. Thomas, 1912; J. Drinkwater, 1913; and H. Hare, 1919.

**Swindling**, see FRAUD.

**Swindon**, municipal bor. of Wiltshire, England, 77 m. W. of London, made up of Old and New S., the latter having grown up around the locomotive dept. and workshops of the former Great W. Railway, which were estab. in 1841, and which provide the chief occupation of the tn. It is an important railway junction. Pop. 68,300.

**Swine**, see PIG.

**Swinemünde**, see SWINOUJSKIE.

**Swinerton, Frank Arthur** (b. 1884), Eng. novelist and critic, b. at Wood Green, London, entered the publishing house of Dent as a boy. Later he became a publisher's reader and literary adviser. His first novel was *The Merry Heart* (1909), while his best work is, perhaps, *Nocturne* (1917). He has pub. critical studies of George Gissing (1912) and R. L. Stevenson (1914). Among his other works are *The Chaste Wife* (1916), *September* (1919), *Coquette* (1921), *Young Felix* (1923), *Summer Storm* (1926), *Tokeliff Papers* (1927), *A Brood of Ducklings* (1928), *A London Bookman* (1928), *Sketch of a Sinner* (1929), *The Georgian House* (1932), *The Georgian Literary Scene* (1935), *Swinerton: an Autobiography* (1937), *The Two Wives* (1939), *The Fortunate Lady* (1941), *Thankless Child* (1942), *English Maiden* (1946), and *Tokeliff Papers Old and New* (1949).

**Swinoujskie** (Ger. *Swinemünde*), seaport, seaside resort, and spa, near the mouth of the R. Swine, on the coast of Usedom in Polish Pomerania, founded in 1743, and fortified in 1925. Shipbuilding, fishing, and timber industries are carried on. It is a railway junction and has an airport. Pop. 20,500.

**Swinton**: 1. Tn. of the W. Riding of Yorkshire, England, 10 m. N.N.E. of Sheffield. It has railway works, and manufs. steel, pottery, glass, and iron goods. Pop. 12,000. 2. S. and Pendlebury, municipal bor. of Lancashire, England, 5 m. N.W. of Manchester. There are cotton manufs., collieries, and tile works. Pop. (estimated) 11,250.

**Swiss Guards**, regiment of Swiss mercenaries, forming the Fr. royal bodyguard constituted in 1616. They were conspicuous for their bravery in the defence of the

Tulleries (1792), which was commemorated in 1821 by the great lion outside one of the gates of Lucerne. The pope's escort is also known as the S. G., being comprised of men recruited from every Swiss canton.

**Switch:** 1. In electricity, a mechanism for making or breaking a circuit, or for transferring a current from one conductor to another. 2. On a railway, a device for moving a small section of track so that rolling-stock may be run or shunted from one line of track to another.

**Swithin, or Swithun, Saint** (*d.* 862), *b.* in Wessex, and educated at the Old Abbey at Winchester, though it is not certain that he ever became a monk. He was ordained and became chaplain to Egbert, king of the W. Saxons, and tutor to his son Ethelwulf, who made him bishop of Winchester on his accession (852). The origin of the popular legend that if it rains on his day (July 15) it will do so for forty succeeding days is uncertain.

**Switzerland**, republic of central Europe, consists of the confederation of twenty-two self-governing cantons (three of them subdivided), bounded on the N. by Germany, W. by France, E. by Austria and Liechtenstein, and south by Italy. It is 220 m. in length from E. to W., about 137 m. from north to south, and is separated from the adjacent countries by the Alpine barriers. While the official language of the Ger. cantons is high Ger. all classes of society retain in speaking the local form of Swiss Ger. The table opposite gives the names of the cantons, the date of their entry into the confederation, and the density of the pop. per square mile, while the initial letters G. (German), F. (French), I. (Italian), or R. (Romansch) indicate the language group to which they belong. S. is a country without seaboard, but has a rich diversity of scenery, including vast snow-capped mts., with abysmal depths and enormous glaciers which form a distinct contrast to the grassy valleys, wooded upland slopes, vineyards, richly cultivated fields, and beautiful lakes and streams. On its pasture land cattle are reared, while ibex and chamois inhabit the rocky crags and woods.

The present formation of the mt. masses of S. is the result of extreme pressure at successive periods from the N.E. and S.W., which has caused the upheaval of the earth's crust, in the course of which the strata have been crumpled, shattered, and even overturned, presenting an endless variety of shapes. The lofty ridges consist principally of crystalline schists in conjunction with granite, the outcrops containing fossiliferous sedimentary rocks. The chief physical feature is the vast Alpine system, known by various names in different localities, *e.g.* the Jura Mts. extend along the W. boundary; the Rhaetian Alps cross the E. frontier into the Tyrol; the Bernese Alps or Oberland occupy the south-central part of the country; the Valais Alps lie on the southern border; the Lepontine Alps, the Rheinwald Alps, and Glarner Alps are situated in the S.E.; while the Urner Alps are in the centre of the country. The highest peak is Monte Rosa, on the It.

frontier, which is 15,217 ft. above sea level, the second highest mt. mass in the Alps, being exceeded in Europe by Mont Blanc only and certain peaks in the Caucasus Mts. The prin. passes over the Alps are Mont Cenis, leading to Savoy; the St. Bernard, leading from the canton of Grisons to the Val d'Aosta; the Simplon, crossing Mt. Simplon and leading to the duchy of Milan; and the St. Gothard, leading to Italy. There are sev. tunnels piercing the Alps, the prin. being the Simplon, the St. Gothard, and the Lotschberg (opened 1913). Light railways ascend many of the peaks, the Jungfrau



Swiss Federal Railways

ABOVE ZERMATT: THE BREITHORN AND THE KLEINER MATTERHORN  
In the middle ground is the Gorner glacier

railway running nearly to the summit (11,342 ft.) from a height of 6770 ft. There are upwards of 1000 glaciers in S., the largest being the Aletsch in the Bernese Oberland, 13 m. in extent, which descends from the slopes of the Aletschhorn (13,721 ft.) to about 5450 ft. Of the many beautiful lakes within or partly within, the limits of the country, the following are the most important: Geneva (224 sq. m.); Constance (208 sq. m.); Neuchâtel (92 sq. m.); Lago Maggiore (84 sq. m.); Lucerne (44½ sq. m.); Zurich (34 sq. m.); Lugano, Thun, Bienna, Zug, Brienz, and Morat, the last six being under 20 sq. m. in extent. The prin. rivs. of S. are the Rhône, Rhine, Inn, Arve, Reuss, Limmat, Aar, and the Thur, the Aar being the most important entirely within Swiss ter. The three rivs. first noted have their sources in the Alpine glaciers: the Rhine flowing N.

and N.W. empties into the North Sea, the Rhône takes an E. and then southerly course to the Mediterranean, while the Inn flows N.E. to join the Danube. Among the valleys may be mentioned the famous Val de Travers and the valley of the Inn or the Engadine. There are large waterfalls, e.g. the Stannbach at Lauterbrunnen in the canton of Bern, which drops 980 ft., and at Schaffhausen on the Rhine, which drops over 100 ft. in three leaps. The forests of S. cover 22 per cent of the country. The chief tns., with their pops., are Zurich (400,000); Basel (162,100); Bern, the cap. (130,300); Geneva (124,400); Lausanne (100,000); Winterthur (64,500); St. Gall (62,500); and Lucerne (60,000).

native coal and other minerals greatly hampered industrial development, but the applications of hydro-electric power have had far-reaching results. The machine industry is the most important in the country. Other industries include brewing and distilling, the manuf. of motor cars, silk and cotton goods, clocks and watches (in Geneva, La Chaux de Fonds, and Le Locle), chemicals, aniline dyes, aluminium, chocolate, condensed milk. Gruyère cheese, lace, embroidery, boots and shoes. In 1948 the exports amounted to 3,434,500 francs, and the imports were valued at £4,998,900. Catering for tourists, who bring a large revenue to S., is one of the important occupations

Canton	Date of entry	Area in sq. m.	Pop. in 1911 (census)	Pop. per sq. m.
Zurich, G.	1351	668	671,505	1010
Bern, G.	1353	2658	728,916	274
Lucerne (Luzern), G.	1332	576	206,608	351
Uri, G.	1291	415	27,302	66
Schwyz, G.	1291	351	66,555	190
Unterwalden:				
Obwalden, G.	1291	190	20,340	107
Nidwalden, G.	1291	106	17,348	164
Glarus, G.	1352	264	31,771	132
Zug, G.	1352	93	36,643	391
Fribourg (Freiburg), F., G.	1481	645	152,053	236
Solothurn (Solothurn), G.	1181	306	151,944	506
Basel (Bale):				
Basel-Stadt, G.	1501	14	169,961	12,140
Basel-Land, G.	1501	165	94,159	572
Schaffhausen, G.	1501	115	53,772	468
Appenzell:				
Appenzell A.-Rh. (Ext.), G.	1513	94	44,756	476
Appenzell I.-Rh. (Int.), G.	1513	67	13,383	200
St. Gall (St. Gallen), G.	1803	777	286,201	368
Grisons (Graubünden), G., L., R.	1803	2,746	128,247	47
Aargau (Argovie), G.	1803	542	270,463	499
Thurgau (Thurgovie), G.	1803	388	138,122	356
Ticino (Tessin), I.	1803	1,086	161,882	149
Vaud (Waadt), F.	1803	1,239	343,398	277
Valais (Wallis), F., G.	1815	2,021	148,319	73
Neuchâtel (Neuenburg), F.	1815	309	117,900	382
Genève (Genf), F.	1815	109	174,855	1604
Total		15,914	4,265,703	268

**Agriculture and Industry.**—S., although basically an agric. country, cannot grow enough crops to support its pop., so that wheat, vegetables, and potatoes are imported. The productive land is owned by some 300,000 peasant proprietors, who raise rye, oats, barley, and potatoes, and manuf. cheese, condensed milk, wine, and tobacco. Stock-raising is extensively engaged in, mainly horses, cattle, sheep, goats, and pigs. Bee-keeping is a thriving industry. Fruit is grown, and there are 50,000 ac. of vines. There are four salt-mining dists., at Schweizerhalle, Rheinfelden, Ryburg, and Bex; iron and manganese ore are mined at St. Gall; asphalt is found in the Val de Travers. With a pop. far in excess of natural resources S. can thrive only by importing raw material and exporting the finished products. Lack of

of its inhab., who are noted for the excellence of their hotels. Swiss winter sports are renowned. There are many sanatoria, especially for pulmonary complaints. The Swiss are not outstanding in the fine arts, but in such crafts as wood-carving they are unexcelled. In machine and engineering they are exceptionally skilled.

**Religion.**—As regards religion, there is full liberty of conscience and of creed, and no man is required to pay taxes to maintain any religion to which he does not belong. Jesuits and their societies are barred, and the foundation of new religions, orders, or convents is not allowed. The Protestants (58 per cent of the pop.) are in the majority in the cantons of Zurich, Bern, Vaud, Neuchâtel, and Basel, while Catholics (40 per cent of the

pop.) predominate in Lucerne, Fribourg, Valais, Ticino, and the Forest cantons.

**Education.**—Swiss reformers have played a large part in the evolution of modern educational theories in W. Europe. Rousseau advocated the relaxation of all discipline and compulsion in teaching. Pestalozzi, though a realist, was influenced by Rousseau. He stressed that as the child was the object of education it was of necessity the centre of it, and must be treated with consideration if it was to benefit from its teaching. In all the cantons of S. education is compulsory and free. There are nearly 1100 primary schools, with 13,700 teachers and 433,300

was opened at Geneva. There is also a commercial univ. of St. Gall.

**Defence.**—The national militia is the defending force of S., and service in it is universal and compulsory. After the outbreak of war in 1939 a total force of 650,000 men was mobilised; but subsequently some of the older classes were demobilised, but the younger classes were called up at an earlier age than hitherto, with the result that a total force of 525,000 men were in 1943 under arms. Mobilisation strength is 720,000. Ordinarily liability to serve in the army extends from the twentieth to the end of the sixtieth year. The gov. decided in



Swiss Federal Railways

A FISHERMAN OF GENEVA (FRENCH TYPE) AND PEASANT OF ST. GALLEN (GERMAN TYPE)

pupils, and over 600 secondary schools and lower mid-schools with 3010 teachers and 75,500 pupils. In addition to these there are commercial schools, industrial schools, improvement schools, technical schools, and schools of agriculture, horticulture, dairy management, hotel management, domestic economy, and viticulture. S. has seven univs., modelled on those of Germany, with four faculties—theology, law, medicine, and philosophy, governed by a rector and a senate. The number of students is over 13,000. The Basel Univ. was founded in 1460, Zurich as an academy in 1523 and as a univ. in 1833, Bern in 1834, Geneva first as an academy in 1559 and then as a univ. in 1892, Fribourg in 1889, Lausanne as an academy in 1537 and as a univ. in 1890, and Neuchâtel as an academy in 1866 and as a univ. in 1909. Fribourg and Neuchâtel Univs. have no faculty of medicine. There is also a Swiss Federal Institute of Technology at Zürich, maintained by the gov. In 1927 a univ. institute for international studies

in 1947 to maintain a peacetime air force of at least 500 aircraft of the most modern type. There are fortifications at St. Maurice, Martigny, and the St. Gothard Pass.

**Finance and Communications.**—The revenue in 1945 was 792,500,000 Swiss francs (about £31,448,500), and the expenditure 2,406,800,000 Swiss francs (about £95,349,000), and the public debt stands at 8,795,000,000 francs (about £349,000,000). The national bank (opened 1907) has the sole privilege to issue Swiss bank notes. The main railway lines were nationalised from 1900 onwards. The total mileage is 3245 m. Electrification has been rapid since 1921, and 1745 tn. of the Swiss Federal system's 1804 m. were electrified by 1948. An internal and international air service was developed from 1919 onwards. A merchant marine was estab. in 1941, registered at Basel, and totalling twelve vessels in 1948. There are numerous tramways and funiculars and the roads are excellent. The post,

telegraph, and telephone arrangements are complete and satisfactory.

**Law and Administration.**—Each canton possesses its own judicial system of civil and criminal procedure; the high court, called the *Bundesgericht* or Federal Tribunal, sits at Lausanne, and is the supreme court and final court of appeal. In 1942 a new Federal penal code replaced the separate cantonal codes. Capital punishment, except for military offences, was abolished in 1942.

Legislative and executive authority are embodied in a Parliament or Federal Assembly consisting of two chambers, a National Council and Council of States, the former consisting of 194 members directly chosen by the people in general election, and the latter composed of 44 members (two for each canton), whose election and term of office depend on the individual canton. All representatives, either of the national or state councils, are remunerated, the national members being elected every four years. Three of the cantons are subdivided, Basel, Appenzell, and Unterwalden, each subdivision being represented by one member in the State Council. Legislative power is vested in a Federal Council of seven members, presided over by the president, which sits at Lausanne, members being elected for four years by the Federal Assembly. The referendum and the initiative are essential features of democracy in S. Every constitutional amendment requires ratification by a popular and a cantonal majority; a referendum on any law can be demanded by 30,000 voters; 50,000 voters can require the submission of any desired law to the usual legislative process. In three cantons direct democracy exists, the citizens of Appenzell, Glarus, and Unterwald meeting annually to elect cantonal officials and pass laws.

**History.**—Prehistoric research in S. flourished between 1939 and 1945. Particular features of interest are the Alpine Stone Age and Neolithic settlements in the cantons of Grisons and Schaffhausen. Some of the well-known pile buildings are now held to be lake dwellings as the water levels in prehistoric times were lower than at present. Much attention has been given to pile dwellings of the Bronze Age, in the excavation of which the technique of pollen analysis has been brilliantly employed. The La Tène period of the Early Iron Age is well represented in southern S. Settlements and forts have been excavated in the canton of Ticino. In the Bonaduz dist. a settlement was occupied by the Rhatians until the Rom. period. The original inhab. of S. were the Helvetii in the N.W. and the Rhatians in the S.E. The Rom. conquest of these tribes began as early as 107 B.C., in which year they were defeated in southern Gaul. Their subjection dates from 58 B.C., when Julius Cæsar acquired their dominions and organized them as a Rom. prov. Christianity was introduced between A.D. 300 and 400. The ancestors of the modern Swiss are the Germanic tribes who began to overrun the Rom. Empire. The Alemanni settled E. of the Aar about A.D. 406, and the Bur-

gundians in the S.W. in A.D. 443. The Ger. peoples became Christians about 600–650, but the Helvetii were not converted till somewhat later. Between 700 and 1200 S. was under the influence successively of the descendants of Charlemagne, the Ger. emperors, and the Zähringen dynasty. Charlemagne (768–814) included S. in his ter. At his death this realm fell into confusion, and in the subsequent partition of his ter. half of modern S. was allotted to the E. Frankish kingdom and half to Lorraine. In 888 Rudolf the Guelph founded the kingdom of Burgundy, and in 917 Alamannia became an independent duchy. In 1038 Burgundy, Alamannia, and Rhetia fell to the Salic king, Henry III. From 1097 till 1218 the Zähringen dynasty ruled well and justly. A period of anarchy ensued, till in 1273 Rudolf of Hapsburg became emperor. On his death in 1291 the First Perpetual League of the three Forest States (Uri, Schwyz, Unterwalden) was formed, and in 1315 defeated the Austrian forces at Morgarten. In 1332 Lucerne, in 1351 Zurich, in 1352 Zug and Glarus, in 1353 Bern, were added to the league, following on a war with Austria, which was defeated at Sempach. In 1415 war with Austria was renewed, and after a Swiss victory at Nafels, Aargau was added to the confederation. From this period dates the rise of Swiss education, art, and industry. From 1474 to 1477 the confederation was engaged in war with Charles the Bold of Burgundy, defeating him at Granson and Morat (1476). In 1481 Fribourg and Soleure came into the confederation. In 1499 Maximilian attempted to bring Rhetia again under the empire, which as the Grey League (Grisons or Graubünden) had asserted its independence, but he was defeated at Calven. Later during the reformation Austria was more successful, but the leaguers retained their independence until they at last joined the confederation in 1803. The independence of S. really dates from the victory over the Empire at Domach in 1499, by which S. was released from the imperial tax. The Reformation led to internal dissension, as the N. generally followed the teachings of Zwingli (and later of Calvin), while the Forest States remained Rom. Catholic. The war which broke out in 1531 settled the relative boundaries of the states owning the two creeds. In 1536 Bern took the Vaud from the dukes of Savoy. During the early sixteenth century Swiss mercenaries were widely employed in Europe. In 1648 S. was acknowledged by the powers as an independent state. The hist. of the seventeenth and eighteenth centuries is one of a patriciate in Bern, Fribourg, Soleure, and Lucerne, and of civic oligarchies in Basel, Zurich, and Schaffhausen. During the whole of this period the peasantry were much oppressed, and their attempt in 1653 to secure better conditions was crushed. S. shared, however, in the *éclaircissement* movement in France; but at the time of the Fr. Revolution it was seized by France, which made it the Helvetic republic (1798). In 1815 its independence was restored, and its

permanent neutrality guaranteed by the powers at the Congress of Vienna. During the nineteenth century religious differences led to bitter controversy and to blows. In 1847 a savage war broke out between Protestants and Rom. Catholics on the question of the suppression of the Catholic Sonderbund. In 1848 a new federal constitution was adopted, and the terms of peace signed, giving the Protestants nearly all they had fought for. In 1874 a federal revision was carried, and in 1891 a demand for popular initiative for measures was carried. In 1908 S. entered into an international convention for compulsory arbitration at the court of The Hague. Surrounded by belligerent countries during the First World War, S. nevertheless retained her neutrality, though the Fr. Swiss and Ger. Swiss naturally differed in their sympathies and their opinions as to the desirability of remaining neutral. In a non-military capacity S. rendered useful assistance to both sides in organising Red Cross units, tracing the missing, and permitting incapacitated prisoners of war to be interned within her frontiers. In 1920 S. entered the League of Nations, which made its permanent headquarters at Geneva.

S.'s international position was compromised by the formation of the Axis (*q.v.*) and by the increasing hostility of the Axis to the League of Nations. A movement arose for an initiative on a proposal to make neutrality a component part of the constitution but, as this would have led to S. abandoning the League, it came to nothing. S. had but a qualified neutrality; after difficult negotiations with the League Council S. had induced the Council to release her in the London Declaration of 1920 from the obligation of taking part in the military sanctions of the League or of permitting preparations for them to be made on Swiss ter., but S. had still to join in economic and financial sanctions. This situation came to an end on May 14, 1938, when the League of Nations Assembly released S. from any participation in the sanctions of the League. In 1939 an initiative proposing an alteration in the constitution by which the Bundesrat would have been subordinate to the Federal Court was rejected by a great majority of individual votes and by all the cantons. On the subject of the so-called 'urgency initiative' the people in a referendum supported the Bundesrat's proposal, which made the declaration of urgency dependent on receiving the support of an absolute majority of members of both chambers and not merely a majority of those present at the voting. On Aug. 28 the Bundesrat ordered the mobilisation of the frontier and air defence troops (see under *Defence*). The outbreak of the Second World War found S. morally well prepared, though the conquest of France by Germany made S. economically entirely dependent upon the latter, and on Aug. 11, 1940, a new trade agreement between the two was signed. War had other effects; rationing soon became inevitable, and, again, in June 1940, a dozen bombs fell at

Geneva and Lausanne, killing sev. people. In that year the Federal Council dissolved the Swiss National movement, a totalitarian organisation closely connected with the Nazis, and soon afterwards they dissolved the Communist party.

When the war spread to Russia and the Balkans, the trade agreement S. had made with Russia earlier in 1941 became worthless. Germany then brought pressure on S. to enter into the closest possible economic association, and as a reprisal against this second agreement Great Britain intensified her blockade against S. S.'s position was no doubt hazardous, especially as she also had to protect herself against attempts to disintegrate her from within, through the machinations of the highly organised Ger. Nazi party in S. itself; people supported the gov. in its severe measures. After the Ger. invasion of Russia Germany demanded of S. a participation in the 'fight for Europe' and adherence to the 'New Order.' Only very few Swiss adherents of National Socialism, fought in the ranks of the Wehrmacht and these were condemned in *contumaciam* by the military courts for serving with a foreign power.

S. did not become a member of the United Nations, though she joined U.N.E.S.C.O. and sev. other international organisations, and took part in the Marshall plan, though without seeking any Amer. aid for herself. As regards W. union the Swiss experience of federation and the combination of peoples of different language would be valuable, but the introduction of interchangeable currencies and freedom of trade would almost inevitably cause at least short-term losses. In 1948 old-age pensions were introduced for the first time; social services are little developed on the whole. The prevalent political sentiments are conservative, except for some industrial areas, though Communists won sev. seats in the 1947 elections.

*Literature.*—Swiss literature, coming as it does from a number of races unconnected in origin and hist., must be regarded as a collection of local literatures rather than as one single thing. The first prominent name in Swiss literary hist. is that of Balbulus Notker (c. 810–912), noted for his composition of *Sequences* and his services to church music. Ekkehard's *Waltharilied* (c. 940) is a poem in Lat. hexameters which deals with Walter of Aquitaine. Of medieval Swiss literature there are Fr. and Ger. 'courtly' romances on 'France, Britain, and Rome the great'; Ger. lyrics; trans. of the Bible into Fr.; miracle and morality plays in Fr.; and vast compilations like Oton de Grandson's *Miroir de Monde*. Among the early poets and writers were Ulrich Boner, the fabulist, whose *Edelstein* appeared in 1349, the first book printed in the Ger. language; Johann von Kaisersberg Geiler (1445–1510), the greatest preacher of his age; and Niklaus Manuel (1484–1530), the satirist. François Bonnivard (1496–1570), antiquary and historian, was the hero of Byron's *The Prisoner of Chillon*. The Swiss reformers and humanists are re-

sponsible for much valuable work. Zwingli (1484-1531) trans. the Bible into Ger., while the clear and incisive polemical style of Calvin (1509-64) has raised him to a high place among Fr. stylists. Scaliger (1540-1609) is famous as a scholar; Konrad Gesner (1516-65) was a noted naturalist and philologist. Theodore Beza or Beze (1519-1605), though Fr., settled in Lausanne. His eds. of the N.T. influenced the Eng. versions of 1557-1611. He presented the famous *Codex D.* to Cambridge Univ. in 1581. Giles Tschudi (1505-72), author of *Chronicon helveticum*, long the outstanding authority on early Swiss hist. from 1000 to 1470, was one of the foremost antiquaries of all time. Among Ger. chroniclers of this period were Stumpf (1500-76) and Bullinger (1504-75). The *Zurich Letters*, pub. by the Parker Society, show the latter's influence on the Eng. Reformation. Thomas Erastus (1524-1583), physician and theologian, is remembered for his celebrated work on excommunication, pub. in 1589. With him begins that long literary connection with England, which persists to this day. His posthumous work was trans. into Eng. as the *Nullity of Church Censures*. J. J. Bodmer (*q.v.*) (1698-1783) and J. J. Breitinger (*q.v.*) (1701-76) led the revolt of the moderns against the ancients in Ger. literature. Bodmer wrote learned works on poetry and literature generally, and trans. *Paradise Lost* in 1732. For a time in the seventeenth century Swiss literature declined, but in the eighteenth century came a reawakening. The works of Crouzet and Ruchert, and Muralt's *Lettres sur les anglais et les français*, are signs of this new spirit. The philosopher Albrecht von Haller (1708-77) was a sturdy upholder of England in intellectual matters, and was much influenced by the inductive method of Bacon. He pub., in 1732, in Ger., an *Essay on Swiss Poetry*, and his own poems are full of grace and tenderness. Gotthelb Emmann. von Haller (1755-86), son of Albrecht, wrote the *Bibliothek der Schweizergeschichte*, so indispensable to the historical student. There were also Euler (1707-83) and the Bernoullis, prominent mathematicians; Isaac Iselin, a philosopher, who challenged the popular historical sequence of the origin and evolution of society from hunting, herding, and farming, by adducing contrary evidence from Polynesia; Emeric de Vattel (1714-67), a Fr.-Swiss, wrote *The Law of Nations* (1758), and is numbered among the founders of international law. Sismondi, the art historian, and Besselov of the Swiss Guards, whose memoirs on the Fr. Revolution are still read by students of that period, deserve mention, as also do Johannes von Muller (1752-1809), the universal historian; J. Georg Sulzer, art critic and author of a *General Theory of Beauty in Art*; Benjamin Constant (1767-1830), author of *Adolphe*; Alexandre Vinet (1797-1847), the theologian and 'Protestant Pascal' whose works (in Fr.) are marked by incisiveness and purity of style; Johann Wyss (1781-1830), the writer of the Swiss national anthem, and author,

with his father, of *The Swiss Family Robinson*; Johann L. Burchard (1784-1817), orientalist and ethnographer; and Jeremias Gotthelf (pseudonym of Albrecht Bitzian) (1797-1854), novelist and moralist, and author of *Wealth and Spirit* (1866) and *Uli, the Farm Servant* (1888). But the greatest name perhaps in Swiss literature is that of J. J. Rousseau (*q.v.*) (1712-88). His disciple Heinrich (Johann) Pestalozzi (1746-1827) is one of the greatest educational reformers. Johann Kaspar Bluntschli (1808-81) of Zurich was politician and constitutional jurist, whose work on contracts has served as model for contracts throughout the world. Eduard Zeller (1814-1908), the historian and philosopher, taught at Bern. J. J. Bachofen (1815-87), jurist, exerted great influence on ethnology by his work *Das Mutterrecht* (1861). Philippe C. Bridel (1757-1845), who wrote both in verse and prose, J. H. Merle d'Aubigné (1794-1872), historian of the Reformation, and Jean Grénaud (1823-97), historian of Valais, may also be mentioned. Leading figures in Swiss literature also include Gottfried Keller (1819-90), novelist and poet, and one of the greatest of Swiss humorists, and Conrad Ferdinand Meyer (1825-98), who was perhaps the greatest poet S. has produced. One of his novels, *Der Heilige*, has been trans. into Eng. (*Thomas à Becket, the Saint*). The nineteenth century saw the impressive figures of Jacob Burckhardt (1818-97), the art historian and critic, and author of works on Constantine the Great, the It. Renaissance, and It. art, the first comprehensive works of their kind; V. Cherbuliez (1829-90), who created the cosmopolitan novel in France; Philip Schaff (1819-93), theologian and church historian (who later became Amer.); Carl Spitteler (1845-1924), who was awarded the Nobel prize for literature in 1920 for his epic *Olympian Spring*; Max Huber (*h.* 1874), an expert in international law; and Charles Ferdinand Ramuz (1878-1947), a poet of great power and virtuosity. Among contemporary Swiss poets and novelists are also Ernst Zahn, whose *Herrgottsfaeden* was trans. into Eng. as *Golden Threads* (1908); Jakob Schaffner (1875-1944), a master of the short story and author of *Die Goldene Frauze* (1912), *A History of Switzerland* (1915), and *Johannes* (1922); John Knittel, novelist, and writer on Arab countries; Joseph Widman (1842-1911), poet, dramatist, and critic; Arnold Ott, dramatist, Isabella Kaiser, authoress of *Mein Herz*, who writes in exquisite Ger. and Fr.; Gottfried Strasser; Marc Monnier; Tisot; Combe; and Ramez, and the poets Tazan, Cognard, Dalcroze, all of whom write in Fr.; Hermann Kessner and Gottlieb Stockar, modern masters of the historical novel; and Paul Ilg, said to be the greatest living epic poet of S., and author of *Menschlein Matthias*. Mention must also be made of Karl Barth of Bern, prof. of theology in Bonn Univ. (1935), and Emil Brunner, whose influence upon continental Protestantism has been profound. *Art.*—Konrad Witz (1395-1447) is the earliest Swiss painter, whose work

survives in the famous altar panels, especially the Hellspeigel altar. His picture of Lake Geneva, done in 1444, is said to be the oldest landscape painting extant in Europe. Urs Graf of Solothurn (1484-1528), Nicolaus Deutsch (1454-1530), and Hans Leu (1490-1531) all specialised in designs for stained-glass panels. Jost Amman (1539-91) was famous for his wood engravings. Stained-glass painting has been a predominantly Swiss art since the Middle Ages. Conrad Meyer and Christoph Maurer have raised the art to a pitch of perfection. Maurer was also a noted draughtsman, as were also Daniel Lindtner (1552-1607), Tobias Stimmer

the symbolist painter and he became a founder of Ger. Expressionism, and remains the most distinguished of the purely Swiss school. Among modern painters is Paul Klee (*q.v.*) (1879-1940). Klee was associated in his early years with the Expressionist Kaudinsky, but in 1912 joined the 'Blanc Reiter' school and became pre-eminently surrealist. In sculpture Jakob Kuss was one of the best-known religious sculptors of the Middle Ages. Sixteenth-century sculptors of note were Jakob de Malacridis and Hans Geiler, an example of whose work may be seen in Bern in the Justice Fountain. Carlo Moderni, a Swiss architect who worked in Rome, was Francesco Borromini's teacher. He designed the facade of the basilica of St. Peter. Notable in the seventeenth century are the names of Jakob Khrer, the architect of Lucerne Cathedral, and Nikolaus Geissler the sculptor, and Caspar Mosbrugger, who rebuilt the Benedictine monastery of Einsiedeln. Other leaders of architecture in the nineteenth century were Karl Moser, who built Zurich Univ. and Congress House, and Paul Bodmer, the fresco painter. But the outstanding leader in architecture to-day is Le Corbusier (*see* ARCHITECTURE).

*Music.*—Among musicians of the eighteenth and nineteenth centuries may be mentioned Hans Huber, composer of symphonies, and Joseph Raff (1822-82), who was a pupil of Liszt. Ernst Ansermer of Lausanne (*b.* 1883), regarded as one of the foremost interpreters of orchestral music on the Continent to-day, is a famous conductor and a pioneer of modern music. Arthur Honegger (*b.* 1892) is a Swiss composer, though he was born in France.

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(1539-84), and Ludwig Ringler (1535-1605). John Henry Fuseli (1741-1825) became in England a Royal Academician. His 'Night Ilag' is in the Brit. Museum. Among landscape painters of the eighteenth to the nineteenth centuries are Adrian Zingg (1734-1816), Wilhelm Gmelin (1745-1821), Johann Hartmann (1753-1830), and Johann Bidermann (1762-1828). Angelica Kaufmann and Samuel Grimm, like Fuseli, worked mainly in England. Landscape and water-colour painters known in Europe are Wolfgang Toepffer (1766-1847), Johann Wetzel (1781-1834), Rudolph Toepffer (1794-1846), the caricaturist, Sigmund Freudenberg (1745-1801), and Arnold Boecklin (1827-1902), the last-named famous for his 'Great Pan' and 'Island of the Dead.' The works of Franz Koenig (1760-1832) were an outstanding example of the tinted engravings which were a big industry in his time. Ferdinand Hodler (1853-1918) executed numerous landscapes, portraits, and lithographs; he was the pupil of Barthélemy Menn 1815-93),



*Swiss without Haloes*, 1949; A. Siegfried, *A Frenchman in Switzerland*, 1950.

**Swivels**, see **HANDCUFFS**.

**Sword** (A.-S. *sweard*; Dutch *swaard*; Low Ger. *sweerd*; Dan. *svaerd*; a sword, allied to the Sanskrit *caru*, a spear or dart), offensive weapon, having a long metal blade (usually of steel), either straight and with a sharp point for thrusting, as the rapier; with a sharp point and one or two cutting edges for thrusting and striking, as the broadsword; or curved with a sharp convex edge for striking, as the scimitar; or a broad, short blade with a slightly curved point, as the falchion. Sabres, used by dragoons, were heavy Ss. used chiefly for cutting. Sailors used the cutlass, which is a broad, straight S., about 3 ft. in length. The blade is fitted into a handle or hilt, which is protected by a guard. The hilt has, in various countries and through the ages, assumed a variety of shapes, either bejewelled, ornate, or plain. The blade is carried in a sheath or scabbard to prevent the weapon doing harm when not in use. Ss. were first used in the Bronze Age, and their typology has been much studied by archaeologists, who have also given profound attention to the development of the S. in the Early Iron Age and in the Rom. era. Certain S. in the Saxon period were sufficiently important to be known in literature. A hist. of arms should be consulted for an account of medieval Ss. See G. F. Laking, *European Arms and Armour*, 1900.

**Sword-fish**, or *Xiphias gladius*, name given to the single species of the mackerel-like family Xiphiidae. Its distribution is practically universal, but it is found most commonly off the shores of N. America, and only occasionally occurs round the Brit. Isles. The average size of the fish is 7 ft., but in some cases it attains a length of from 12 to 15 ft. It is peculiar in possessing an elongated snout formed from the upper jaw, and with this sword-shaped weapon it can pierce through the planks of ships or spear its prey, such as mackerel and herring. A very different fish, *Belone vulgaris*, a member of the family Scombroideae, is also known as the S.

**Sword Lily**, see **GLADIOLUS**.

**Sybaris**, Gk. tn. in Lucania, between the Rs. Sybaris and Crathis, at a short distance from the Tarentine Gulf. It was founded 720 B.C. by Achæans and Træzenians, and soon attained an extraordinary degree of prosperity and wealth. Its inhab. became so notorious for the love of luxury and pleasure that the name Sybarite was employed to indicate any voluptuary.

**Sybilline Books**, see under **SIBYL**.

**Sycamore** (*Acer pseudo-platanus*), handsome spreading tree (order Aceraceæ), introduced into Britain in medieval times and now thoroughly naturalised. It bears large five-lobed serrate leaves and pendulous racemes of green flowers, followed by reddish-green winged seeds (samaras). The wood is white and fine-grained, and is much used by turners. The tree is often planted on account of its rapid growth to form a screen for valuable fruit trees.

**Sydenham of Combe, Sir George Sydenham Clarke**, first Baron (1848-1933), Eng. soldier. He was governor of Victoria from 1901 to 1904, when he was made secretary of the Committee of Imperial Defence. He became Lord Sydenham in 1913, on relinquishing the governorship of Bombay, to which he was appointed in 1907. He wrote sev. works on military and naval matters.

**Sydenham, Thomas** (1624-89), Eng. physician, b. in Dorsetshire, and admitted a commoner of Magdalen Hall, Oxford, in 1642. About 1648 he obtained a fellowship of All Souls College. Subsequently he quitted Oxford, and having taken the degree of doctor of medicine at Cambridge, he became a licentiate of the College of Physicians, and settled in London. In 1666 S. pub. his first work, which consisted of observations upon fevers. An enlarged ed. of this treatise appeared under a new name in the year 1675. Remarks on the epidemic diseases of London from 1675 to 1680, a treatise on dropsy and on the gout, and a tract on the rise of a new fever were his prin. other pubs. S. was the founder of clinical medicine, and one of the first to recognise the importance of diet in resistance to illness. His works were trans. from the Lat. by Dr. Swan; the best ed. is that of Dr. Wallis, pub. in 1789.

**Sydney, Algernon**, see **SIDNEY**.

**Sydney**, largest city and chief port of Australia, cap. of New S. Wales, situated on the southern side of Port Jackson and the E. shore of Darling Harbour, about 4 m. from the Pacific Ocean. The harbour, extending inland for 13 m. with a water frontage of 188 m., is regarded as one of the most beautiful and perfect harbours in the world. The area of the harbour proper is 22 sq. m., with 75 m. of foreshore, and of this area about 7 sq. m. have a low-water depth of from 35 to 160 ft. Over 1000 ac. are accessible for anchoring the largest ocean-going steamers. With Newcastle, S. carries practically all the overseas trade of New S. Wales, and nearly half that of Australia. It is a naval station of the first class, with dockyards, victualling yards, and coaling depots. On Garden Is. a well-appointed naval estab. has been erected, and between it and the foreshore the Capt. Cook Dock, the largest of its kind in the southern hemisphere, was built and opened in 1941. Other is. in Port Jackson are Shark Is., used as a quarantine station, Spectacle and Goat Is., depots for explosive stores, Clark Is., a popular watering-place, and Cockatoo Is., with extensive dockage accommodation. The southern shores are indented by numerous bays, whose waters are filled with shipping from all parts of the world. Over 11,000,000 tons of shipping entered and cleared the port in 1948-49. There is a terminal elevator at S. capable of holding 6,700,000 bushels of wheat, with facilities for cleaning and drying the grain and delivering it into four vessels at once at the rate of 1000 tons an hour. The harbour is crossed, in one span, by a 3770-ft. steel arch bridge, erected in 1932, carrying a roadway, two footways,

and four lines of railroad. The city is well built, containing many imposing edifices and substantial business houses. Among them may be mentioned St. Andrew's Cathedral, St. Mary's Cathedral (Rom. Catholic), the univ., the tn. hall, Gov. House, Parliament House, the hospital, etc. The univ. was founded in 1850, is subsidised by the gov., and was attended in 1948 by 10,618 students. There are affiliated to it denominational colleges. The foundation-stone of the future Univ. of Technology was laid in 1950. The city has sev. fine parks and other open spaces, the prin. being the Domain, Centennial, Moore, Belmore, and Wentworth Parks, and the botanical gardens. There is a fine National Art Gallery, state library, conservatorium of music, museums, and excellent zoological gardens. Within easy journey of the city are beautiful beaches and varied countryside. Boating and yachting in the harbour are additional attractions for pleasure-seekers. The mean seasonal range of S.'s temp. is only 17° from 71° Fahrenheit in summer to 54° in winter; and the normal rainfall is 42.50 in. in a year. The communications of the city are excellent; it is the chief centre and terminus of the New S. Wales railway system, and is served internally by railway, tram, bus, and ferry, all in a highly organised condition. The Kingsford-Smith airport at S. is an international air terminus, and during 1947-48 2,000,000 passengers were accommodated. An underground railway was opened in 1932. S. is the manufacturing as well as the commercial centre of New S. Wales. The industries include, besides minor manufs., the manuf. of woollens and other textiles, steel and iron goods, machinery, coaches, etc. The bulk of Australian wool is sold in S. There are many flour mills and thriving market gardens and poultry farms on the outskirts, and the city is the chief distributing centre for the deep-sea fisheries. Pop. 214,000; with its sixteen suburbs, 1,484,400. S. was founded by Capt. Arthur Phillip, who had been sent to Australia to establish a penal colony. He landed at Botany Bay in 1788, but finding it unsuitable for settlement, he proceeded to Port Jackson, where he formed the nucleus of what is now the premier city of Australia.

**Sydney**, city and seaport of Cape Breton Is., Nova Scotia, Canada, 18 m. N.W. of Louisburg. It is the centre of a coal-mining region, and is one of Canada's chief coal-shipping ports. Here are the works of the Dominion Iron and Steel Company. The Canadian National Railway has its terminus here. Pop. 28,300.

**Syene**, anct. name for Aswān (q.v.).

**Syenite**, see under IGNEOUS ROCK.

**Sykttyvkär**, formerly Ust-Sysolsk, cap. of the Komi (Zyryan) autonomous republic of the R.S.F.S.R. There is trade in fur and timber.

**Sylhet**, dist. and tn. of Pakistan, in E. Bengal, on the Surma R., 49 m. S. of Shillong. Rice is grown. The dist. is 5478 sq. m. in area, with a pop. of 3,116,600. Pop. of tn. 19,300.

**Syllabus, Papal**, name given to two lists

of heresies and errors condemned by papal authority. The better known is the syllabus of Pius IX. (1864) which condemned no less than eighty errors dealing with almost every dept. of modern thought. The syllabus of Pius X., the decree *Lamentabili sane exitu*, was issued in 1907, and condemns the chief tenets of modernism in sixty-five theses. This syllabus is supplemented by the oath against modernism fixed in 1910. Both lists are in H. Denzinger-Bannwart's *Enchiridion Symbolorum* (23rd ed. 1937).

**Syllogism** (sōl, together, λόγός, thought, i.e. the joining together in thought of two propositions), 'the act of thought by which from two given propositions we proceed to a third proposition, the truth of which necessarily follows from the truth of these given propositions' (Jevons). The first two propositions in the S. are called the *premises* and the last the *conclusion*, e.g. mercury is not solid, mercury is a metal; therefore some metal is not solid. The three propositions of a S. are made up of three ideas or terms, called the *major*, the *minor*, and the *middle*. The subject of the conclusion, which necessarily follows from the premises, is called the *minor* term; its predicate is the *major* term, and the middle term is that which shows the connection between the major and minor terms in the conclusion. S. are sometimes divided into single, complex, conjunctive, etc., and sometimes into categorical, hypothetical, conditional, etc. The special rules of the S. are (1) Every S. has three, and only three, terms. (2) Every S. contains three, and only three, propositions. (3) The middle term must be distributed (i.e. taken universally) once at least, and must not be ambiguous. (4) No term must be distributed in the conclusion which was not distributed in one of the premises. (5) From negative premises nothing can be inferred. (6) If one premise be negative, the conclusion must be negative; and *vice versa*, to prove a negative conclusion one of the premises must be negative; and as corollaries from the above. (7) From two particular premises no conclusion can be drawn. (8) If one premise be particular, the conclusion must be particular (Jevons). A bad S., with one of the premises implied only, is the first source of fallacy.

**Sylv, N. Frisian** is., forming part of Schleswig-Holstein, Germany. It is the largest of the group, having an area of 38 sq. m., and is connected to the mainland by the Hindenburg dam. Its chief vill. is Westerland, a noted holiday resort on the W. coast. Pop. 5000.

**Sylva, Carmen**, see ELIZABETH (PAULINE ELIZABETH OTTILIE LOUISE).

**Sylvester** (popes), see SILVESTER.

**Sylvia**, see WARBLERS.

**Sylviculture**, see ARBORICULTURE; FORESTRY.

**Sylvius Jacobus** (the Latinised name of Jacques Dubois) (1478-1555), Fr. anatomist, began to lecture on anatomy at the Royal College, Paris, when he was already over fifty years old. His lectures were mere expositions of his master, Galen.

**Symbiosis, or Mutualism**, intimate relationship between separate organisms, one of which may have been originally parasitic on the other, but by modification the two have become able to live together and derive mutual benefit from each other's presence. Each lichen is a combination of a fungus and one or more kinds of algae, living in active partnership. *S.* exists between a fungus and certain rye-grasses, the mycelium (mushroom spawn) being vegetatively perpetuated in the seed of the plant and not by spores; infected plants are found to be more vigorous than uninfected ones. Leguminous plants and nodule bacteria are in symbiotic relationship, the latter supplying the roots of the plants with nitrogen, and in return receiving carbon and other necessary food elements. A further example is provided by the symbiotic green alga (*Zoochlorella*) in the endoderm cells of *Hydra viridis* and in the marine worm *Coronula*. *S.* is a closer association between the two partners than occurs in *commensalism* (*q.v.*), which is exemplified by the hermit crab and the sea anemone living on its shell, though the two terms are often used synonymously.

**Symbolism**, sign or representation of any moral or spiritual thing by the images or properties of natural or material things; or the assumption in external things of an inner spiritual meaning, *e.g.* the lion is the symbol of courage, the lamb of meekness or patience. Symbols themselves are of various kinds, as types, enigmas, parables, fables, allegories, emblems, hieroglyphics, etc. Some closely approximate to or rather are readily suggestive of the inward significance with which they are invested, or the event of which they are the representation, while others, like the material objects of idolatry, are often either in no way apparently related to such significance or representation, or such connection as there may be is to be sought in some long-forgotten association of ideas, *e.g.* the tree-trunk which assists a savage to meditate on some divine conception merely because thousands of his ancestors having so regarded such symbol it has become sanctified with a halo of reverence. *S.* is also specifically applied to the system which invests the forms of Christian ritual, dogma, and the fabric and architecture of the churches with a symbolical meaning. In Christian theology every sacrament is an outward and visible sign of an inward and spiritual grace. The different churches vary in their views as to the nature of the reality which the *S.* represents. The full Catholic view is that the sacrament actually performs spiritually what it symbolises: at the other extreme are those who regard the sacraments as little more than *S.* See A. N. Whitehead, *Symbolism*, 1928.

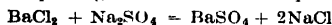
**Symbolist, l'École**, reactionary school of writers which arose against the Parnassians (*q.v.*). Its main object was the reproduction of forms and colours by the logical transcription of the idea. According to its originators poetry should

translate the deepest secrets of the soul by means of symbols connecting the physical with the moral world. The originator was Alfred de Vigny, and its prin. exponents were Mallarmé, Baudelaire, and Verlaine, and among the more recent Laforgue, Kahn, Verhaeren, and Vielé-Griffin. As an offshoot Moréas founded the *Roué* school. Allied to the literary movement was a group of painters, among them Gustave Moreau and Odilon Redon, whose work, striving to be 'ideational, synthetic, subjective, decorative,' often became overburdened with ingenuity and intellectualism. See A. Symons, *The Symbolist Movement in Literature*, 1899, and P. Quennell, *Baudelaire and the Symbolists*, 1929.

**Symbols**. A symbol is a conventional or arbitrary sign, by means of which the writing of names in science is much simplified.

**Chemical**.—Dalton was the first to introduce a reasonable system of chemical *S.* He represented the atoms of substances by means of circles, an atom of one substance being distinguished from that of another by some mark inside this circle. Thus a clear circle  $\bigcirc$  represented an atom of oxygen,  $\odot$  an atom of hydrogen,  $\bullet$  one of carbon,  $\oplus$  an atom of sulphur, and so on. He thought that water was the combination of one atom of oxygen with one of hydrogen; he therefore represented a molecule of water by  $\bigcirc\odot$ . His *S.* were entirely superseded by those introduced by Berzelius. The symbol for an atom of an element is usually represented by the first letter of the name of the substance. Thus carbon C, hydrogen H, oxygen O, etc. In some cases, where the names of several elements have the same initial letter, two letters are employed, thus chlorine Cl, copper Cu, cobalt Co. In some few cases the initial letter or letters of the Lat. name is used, thus gold (aurum) Au, silver (argentum) Ag, and so on. It is known that two atoms of hydrogen combine with one of oxygen to form water. Thus  $H_2O$  represents a molecule of water and conveys the above information. In a similar manner a molecule of hydrogen is written  $H_2$ , because it is known to contain two atoms.  $NH_3$  stands for a molecule of ammonia, and implies that three atoms of hydrogen and one of nitrogen are combined. The symbols H, N, etc., are often used loosely also for the atomic weight in grammes (*q.v.*) of the element (*q.v.*). Thus  $H_2$  represents two grammes of hydrogen, and  $NH_3$  conveys the idea that fourteen grammes of nitrogen are combined with three grammes of hydrogen to form seventeen grammes of ammonia. Similar *S.* can be constructed for all compounds. If the *S.* represent gases then we have also a volume relation, because the molecular weight in grammes of a gas occupies 22.4 litres at  $0^\circ C$ . and 760 mm. pressure ('N.T.P.'). Thus  $H_2$ ,  $N_2$ ,  $NH_3$ , can represent 22.4 litres of hydrogen, nitrogen, and ammonia respectively. *S.* are also employed to express chemical reactions, by means of equations. The *S.* of the interacting substances are placed, with a plus sign in between, on the left-hand side of

the equation. On the right-hand side are placed the S. of the substances formed, also with a plus sign in between. The equation



means that a molecule of barium chloride ( $\text{BaCl}_2$ ) reacts with a molecule of sodium sulphate ( $\text{Na}_2\text{SO}_4$ ) to give one molecule of barium sulphate ( $\text{BaSO}_4$ ) and two molecules of sodium chloride ( $\text{NaCl}$ ). Or that 208 grammes of barium chloride interact with 142 grammes of sodium sulphate to give 233 grammes of barium sulphate and 117 grammes of sodium chloride. If the interacting substances are gases, we have a relation between the volumes employed in addition to the gravimetric relation above. Thus  $\text{H}_2 + \text{Cl}_2 = 2\text{HCl}$  means that one volume (22.4 litres) of hydrogen combines with one volume of chlorine to give two volumes (44.8 litres) of hydrochloric acid gas. In a similar manner interactions between gases and solids or liquids can be expressed either gravimetrically or volumetrically, or as a combination of the two.

**Arithmetical.** + (plus) means addition; positive; - (minus), subtraction; +ve, positive; -ve, negative; + and - stand for positive and negative in magnetism, electricity, or when referring to a direction; =, equality; three strokes (≡) means identically equal; ×, multiplied by; ÷, divided by; divided by is also expressed thus,  $\frac{a}{b}$ , i.e.  $a$  divided by  $b$ ; √, square root; ∛, cube root;  $\sqrt[n]{\phantom{x}}$ ,  $n$ th root, and so on;  $a^n$  means  $a$  multiplied by itself  $n$  times;  $a^{\frac{1}{n}}$  means the  $n$ th root of  $a$ ;  $a^{-n} = \frac{1}{a^n}$ ;  $a^0 = 1$ ; ∴ = therefore; ∵ = because. The expression  $a : b :: c : d$  means that  $a$  is to  $b$  as  $c$  is to  $d$ , or  $\frac{a}{b} = \frac{c}{d}$ ; ∝, varies as, e.g.  $y \propto x$ ,  $y$  varies as  $x$ ; >, greater than; >, not greater than; <, less than; <, not less than, e.g.  $a > b$ ,  $a$  is greater than  $b$ ; ~, the difference of, e.g.  $x \sim y$ , difference of  $x$  and  $y$ ;  $x \approx y$ ,  $x$  is similar to  $y$ ; ∼, equal and similar; □, square; □, cms., square centimetres, also written sq. cms.; c.c., cubic centimetres; cm., centimetres; mm., millimetres; gm., grammes; £ s. d., pounds, shillings, and pence. Feet and inches are written ' and "; thus 5' 6" > 4' 3" means 5 feet 6 inches by 4 feet 3 inches; ∞, infinity, a quantity greater than any we can name. 0, zero, n! or  $n!$  (factorial  $n$ ) means  $n(n-1)(n-2) \dots 1$ .  ${}^nC_r$ , combinations of  $n$  things  $r$  at a time;  ${}^nP_r$ , permutations of  $n$  things  $r$  at a time; { } ( ), brackets; Σ, the algebraic sum of;  $a, b, c$  etc., usually denote constants, and  $x, y, z$  variables.

**Geometrical.** □, square; □', square inches; □'', square feet. Length is denoted usually by  $l$  or  $L$ , area by  $A$  or  $a$ , volume by  $V$  or  $v$ , radius by  $R$  or  $r$ , diameter by  $D$  or  $d$ , radius of curvature by  $\rho$ , angle  $\widehat{ABC}$  by  $\angle ABC$  or  $\angle ABC$ ; ⊥, right angles; ⊥ $\perp$  or ⊥ $\perp$ , at right angles or perpendicular to; ∥, parallel; ✕, not parallel;

□ rectangle; ○ circle; ( parabola;

⊖ ellipse; ✕ hyperbola;

R.H., rectangular hyperbola; |m, or □m, parallelogram; ||piped, parallelepiped.

*f(x), F(x), φ(x), ψ(x), etc.*, functions of  $x$ ;  $f(x, y), F(x, y), \phi(x, y), \psi(x, y), \dots$ , functions of  $x$  and  $y$ ;  $f^{-1}(x), F^{-1}(x), \dots$ , inverse functions of  $x$  and  $y$ ; D, differentiation;  $\frac{d}{dx}$ , differentiation with respect to  $x$ .


Thus  $\frac{dy}{dx}$ , differentiation of  $y$  with respect to  $x$ ;  $\frac{d^ny}{dx^n}$ ,  $y$  differentiated  $n$  times with respect to  $x$ ; δ, increment, thus  $\delta x$  is the increment of  $x$ ;  $\frac{\partial}{\partial x}$ , partial differentiation; ∫ or ∫ $^{-1}$ , integrate. In Newton's fluxional notation  $\dot{x}$  means differentiate  $x$  with respect to time;  $\ddot{x}$  differentiate twice, and so on.

**Trigonometrical.**—P ( $x, y$ ), the co-ordinates of point P are  $x$  and  $y$ . Sin, cos, tan, etc., are abbreviations of the circular functions sine, cosine, tangent, etc. 50° 40' 24" means an angle 50 degrees 10 minutes 24 seconds (see TRIGONOMETRY).  $\pi = 3.14159$ , approximately ratio of circumference of a circle to its diameter;  $\sin^{-1}$ ,  $\cos^{-1}$ , inverse of sine, cosine, thus if  $\theta = \sin^{-1} x$ ,  $\sin \theta = x$ . The sides of a triangle  $ABC$  are usually denoted by  $a, b, c$ ,  $a$  being opposite  $A$ , and so on. An angle is often denoted by  $\phi, \theta, \psi, \alpha, \beta$ , etc. Log., logarithm;  $e$ , the base of the napierian or hyperbolic logarithms.

**Mechanical.**—C. G. S., centimetre-gramme-second system; F.P.S. or ft. lb. sec., foot-pound-second system;  $g$ , value of gravitational acceleration;  $M, m$ , mass;  $V, v$ , velocity;  $a, f$ , acceleration;  $V$ , volume;  $A, \text{area}$ ;  $W$ , weight;  $w$ , weight of unit mass;  $K.E.$  or  $T$ , kinetic energy;  $V$ , potential energy; ft. lbs., foot-pounds in work; lb.-feet, pound-feet in momentum;  $T, t$ , time;  $F$ , force;  $T$ , tension;  $p$ , pressure;  $\omega$ , angular, velocity;  $\rho$ , volume density;  $\sigma$ , surface density;  $\lambda$ , line density;  $E$ , Young's modulus;  $N$ , rigidity modulus;  $n$ , number of;  $I$ , moment of inertia;  $T.M.$ , twisting moment;  $B.M.$ , bending moment;  $Q$ , quantity; H.P., horse-power.

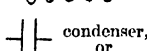
**Physical.**— $t^\circ$ , temp. in degrees;  $J$ , Joules's equivalent;  $F^\circ$ ,  $C^\circ$ , degrees Fahrenheit and centigrade respectively. **Electrical.**— $x, y, z$ , etc., current,  $C$ , continuous current in amperes;  $C_e, C_a$ , external and armature current;  $R$ , resistance in ohms;  $R_a, R_s$ , resistance of armature and shunt;  $\rho$ , specific resistance; E.M.F., electromotive force, or simply  $E$ , also in volts;  $I$ , maximum alternating current;  $i$ , effective alternating current.  $L, M$ , coefficients of self and mutual inductions;  $\mathcal{L}$ , impedance;  $\omega$ , ohm;  $\Omega$ , megohm;  $K, k$ , capacity or specific inductive capacity;  $mfd$ , microfarad;  $Q, q$ , quantity of electricity;  $z$ , electrochemical equivalent;  $il$ .


cell; |||||, battery of three cells in series; F.M., field magnet.

 inductive resistance

 non-inductive resistance;

 alternating current transformer;

 condenser, or

 glow lamp;

— arc-lamp.

P., power in watts; WJ, work in Joules; G., galvanometer; s, shunt; A, ammeter; V, voltmeter; n, number of turns of wire; —, alternations per second; B.T.U., Board of Trade units; B.Th.U., Brit. thermal units.

**Magnetic.**—N, S, north and south poles of a magnet; m, strength of pole; l, distance between poles; M, magnetic moment; H, strength of magnetic field; I, intensity of magnetisation; B, magnetic induction; K, magnetic susceptibility;  $\mu$ , magnetic permeability; M.M.F., magnetomotive force.

**Astronomical.**—Conjunction,  $\delta$ ; opposition,  $\delta$ ; new moon,  $\bullet$ ; first quarter,  $\smile$ ; last quarter,  $\frown$ ; full moon,  $\circ$ ; longitude of ascending node,  $\Omega$ ; longitude of descending node,  $\omega$ ; inclination of orbit to ecliptic,  $i$ ; argument of latitude,  $\omega$ ; perihelion distance,  $q$ ; time of perihelion passage,  $T$ ; period of revolution,  $P$ ; zenith distance,  $z$ ; azimuth,  $A$ ; right ascension,  $\alpha$ ; declination,  $\delta$ ; celestial longitude,  $l$ ; celestial latitude,  $b$ ; magnitude of a heavenly body,  $m$ ; hour angle,  $h$ . The S. of the planets are Mercury,  $\xi$ ; Venus,  $\phi$ ; the Earth,  $\oplus$ ; Mars,  $\delta$ ; Ceres,  $\rho$  or (1); Eros, [433]; Jupiter,  $\pi$ ; Saturn,  $\zeta$ ;

Uranus,  $\mu$ ; Neptune,  $\nu$ ; Pluto, P. For the signs of the Zodiac, see ZODIAC.

**Symeon of Durham**, see SIMEON.

**Symonds, John Addington** (1840–93), Eng. man of letters, b. at Bristol, was educated at Harrow and Balliol College, Oxford. His critical lives of Shelley (1878), Sir Philip Sidney (1886), and Michelangelo (1893) are of great merit, and his *Autobiography of Benvenuto Cellini* (1887), and his versions of the sonnets of Michelangelo and Campanella, exhibit his admirable gifts as a translator. See life by H. F. Brown, 1895; and M. Symonds, *Last Days of J. A. Symonds*, 1906, and *Out of the Past*, 1925.

**Symons, Arthur** (1865–1945), Brit. poet and critic, b. in Wales. Influenced by the Fr. symbolists, in 1889 he pub. a book of verses, *Days and Nights*. His next two vols. of poetry, *Silhouettes* (1892, 1896) and *London Nights* (1895, 1897), showed the influence of Verlaine, but the decisive influence upon his work was the æsthetic doctrine of Walter Pater. Though S. never succeeded in constructing a system

of æsthetics he deserves to be remembered as a critic by such works as *Introduction to the Study of Browning* (1886, 1906); *Studies in Two Literatures* (1897); *Aubrey Beardsley* (1898, 1905); *The Symbolist Movement in Literature* (1899), a pioneer work in which he introduced to England the Fr. poets of the later nineteenth century; *Studies in Seven Arts* (1906), and his *Confessions: a Study in Pathology* (1930), in which he analysed his own mental collapse of 1908 and numerous others. The work he pub. after 1908, except for occasional gleams of his old vision, falls far below the level of his books prior to that date. See lives and studies by T. E. Welby, 1925, and M. Wildi, 1929; A. Waugh, *Tradition and Change*, 1919, and W. B. Yeats, *Autobiographies*, 1926.

**Sympathetic Inks**, see INK.

**Sympathetic Nerves**, see NERVOUS SYSTEM.

**Sympathy** (from Gk. *syn* together, *πάθος*, feeling), or **Fellow-feeling**, in a human is an emotional state caused by intense consciousness of the sufferings, feelings, hopes, and pleasures of another living creature. See EMOTIONS; FEELINGS.

**Symphonic Poem**, type of orchestral work categorised as programme music. A descriptive programme is supplied in a literary form, or outlined by a literary quotation. The term was invented by Liszt, who wrote thirteen S.'s. See also under MUSIC.

**Symphony**, musical composition for orchestra. The S. was evolved in the Mannheim school, perfected by Haydn, and extended by Mozart. Beethoven expanded the S. without fundamentally changing it, and Schubert impressed his own personality on the purely classical form. Berlioz and Spohr introduced programmatic elements. The S. began to disintegrate with Schumann and Franck, but was reconsolidated by Brahms. Dvořák, Tchaikovsky, and Elgar. Bruckner introduced Wagnerian elements; Mahler added voices (as in Beethoven's ninth S.) and a literary element. Vaughan Williams also began with words and a pictorial element, but returned to pure music in the fourth and fifth S. There are many departures from the normal form of S., which is that of the sonata (q.v.), but on a larger scale and usually with four movements, i.e. retaining the minuet or scherzo.

**Symposium** (Gk. *συνάσιον*, a drinking party). The title was used by both Plato and Xenophon for books describing the conversations of Socrates and others, and hence the term has changed its meaning to that of a conference or general discussion; also used to signify a collection of opinions on a given subject by various contributors.

**Synagogue** (Gk. *συναγωγή*, an assembly), Jewish place of worship. Some scholars suggest a pre-exilic origin for the S., others, with more probability, date its origin in the period of the Babylonian exile at the very earliest. It is also a matter of dispute whether the first S. are to be sought in Palestine or in the Diaspora. However their institution may be traced through archaeological finds in

Egypt to the third century B.C., and Greece (Is. of Delos) to the second century B.C. Although there is no doubt that there were Ss. in Palestine at a much earlier date, the oldest archeological trace of a S. there, is an inscription from Jerusalem, which mentions the existence of a S. in the first century B.C. Ss. began as rooms in private houses, but in Palestine we find only the later and more formal basilica style, in which the main hall contains a nave and two side isles, separated by two rows of columns. The best preserved S. in Palestine is that of Capernaum (late second century A.D.), which is orientated southward, i.e. towards Jerusalem. Another famous S. is that of Dura Europos (on the upper Euphrates), constructed in A.D. 244, which was found almost intact, and was excavated in 1932-33. Its richly painted walls suggest the dependence of early Christian art upon Jewish art.

**Synaptase**, see **EMULSIN**.

**Synchromesh Gears**, see under **MOTOR CARS, Transmission**.

**Synchroscope**, see under **ELECTRIC SUPPLY, Alternating Current**.

**Syncope**, displacement of the musical accent to the weak beats or off-beats in the bar, the effect being that of a syncope or missing heart-beat. S. is found in anct. folk-song, in classical and in serious romantic and modern music, and is thus not the sole property of jazz or swing.

**Syncope** (from the Gk. *συνκοπή*, cutting short, from *κόπτω*, I cut): 1. grammatical term denoting the elision or non-pronunciation of a letter in the middle of a word, as, for example, of the 'e' in 'heav'n' and of the 'v' in 'e'er.' 2. Alternative term for fainting (*q.v.*).

**Syndic** (Gk. *σύν*, together, and *δικον*, justice), in anct. Greece, an advocate in a court of justice. In the Rom. digest it means an attorney or agent for a *universitas* or corporate body; in which sense Galus uses it as a synonym for *actor*. In the Middle Ages, *syndicus* meant the agent or factor appointed by corporations to manage their common affairs, though more especially to represent them in law courts. In Europe S. meant a gov. official invested with different powers in different countries, or a kind of magistrate entrusted with the affairs of a city or community. In Geneva the S. was the chief magistrate. Almost all the companies in Paris had their S. Ss. still exist in Cambridge Univ., one of their functions being the supervision of the Univ. press.

**Syndicalism**. The word is derived from the Fr. *Syndical*. In France, where S. originated, a syndicate did not mean, as in Eng., a trading company, but an organisation of working men. The fundamental difference between S. and Socialism lies in their attitude to the State (see **SOCIALISM** and **LABOUR PARTY**). The syndicalist, like the anarchist, is in active hostility towards the state, which he repudiates. He sees social organisation as purely industrial, and aims at organising all the workers in a trade into one union, and then to federate these unions into a

national, and eventually into an international, organisation.

S. made its appearance in Britain towards the end of the first decade of this century, but the general public was first made aware of its existence by the series of widespread strikes in the year 1911. (See **LABOUR DISPUTES, INDUSTRIAL COURT, and INDUSTRIAL RELATIONS**.) In 1912 a number of prosecutions and convictions of Eng. syndicalists took place. Tom Mann, Guy Bowman, and Gaylord Wilshire were leading Eng. syndicalists. The first international syndicalist conference was held in London in the autumn of 1913 (see also **TRADE UNIONS**).

The intellectuals of the S. movement in France were Sorel, Berth, and Lagardelle, and other chief exponents were the Its. Labriola, Leone, and Malatesta, the Spaniard Durutti, and Leon of the U.S.A.

The progress of S. was stopped by the First World War, and many syndicalists transferred their allegiance to the Communists. Syndicalist ideas, however, have not been without some influence on the conception of the corporate state (*q.v.*) and on the Labour movements in some of the S. European republics. See A. Clay, *Syndicalism and Labour*, 1911; L. Levine, *The Labour Movement in France*, 1912; L. Jonhauix, *Le Syndicalisme et la C. G. T.*, 1920; and L. Valiani, *Storia del Socialismo nell secolo xx*, 1945.

**Syndicate**, economic partnership of persons or companies formed to carry out a financial or industrial project or enterprise. The legal basis of the partnership may vary, but usually, in the absence of express stipulation to the contrary, such a partnership legally continues only up to the termination of the adventure which is the subject of the partnership. Similarly in the case of joint-stock companies under the Companies Act 1948 (consolidating preceding statutes) if the main object of a company is gone, the company must be wound up. In connection with joint-stock companies, the formation of a S. is a common mode of settling about the flotation of a company; and it is further to be noted that a S. is generally itself an incorporated company which, having acquired a certain undertaking, sells it to another company at a profit, taking either cash or shares or both in exchange, the directors and promoters of the preliminary company or S. as a rule, becoming large shareholders and directors of the new company. One of the most important kinds of S. is that of Lloyds Underwriter (*q.v.*). These Ss. are not usually partnerships; each name takes only his share of the risk.

A different form of S. is the newspaper S. through which articles, stories, cartoons, etc., are distributed among a large number of newspapers over a wide area.

**Synesius** (c. 370-c. 414), Gk. philosopher, b. at Cyrene. At first a neo-platonist, he became a Christian and was appointed bishop of Ptolemais in 411. See study by J. Hermelin, 1934.

**Synge, John Millington** (1871-1909), Irish dramatist, b. at Rathfarnham, co. Galway, and educated at Trinity College,

Dublin. He studied music in Germany (1893) and literary criticism in Paris (1895), where he was 'discovered' by Yeats (1899) and persuaded to identify himself with the so-called 'Celtic Renaissance' movement. He had an exceptionally clear insight into the character of the Irish peasantry, having on Yeats's advice studied the life of the fishermen of the Isle of Aran, and wrote a number of remarkable plays illustrative of their way of life and feelings. In 1904 he helped to found the Abbey Theatre, Dublin. His writings include *Shadow of the Glen* (1903); *Riders to the Sea* (1904); *Well of the Saints* (1905); *Playboy of the Western World* (1907); *Tinker's Wedding* (1907); and *Deirdre of the Sorrows* (1910) (plays); *The Aran Islands* (1907); *In Wicklour, West Kerry, and Connemara* (1911) (prose); and *Poems and Translations* (1909). A collected ed. of his plays was pub. in 1949. See study by L. A. G. Strong, 1941.

**Synonym** (Lat. *synonymum*; Gk. *σύν*, together, *νόμα*, name), term applied to a word which has the same or almost the same meaning as another word, or to a pair of words with the same meaning, e.g. 'begin' and 'commence.'

**Synoptic Reporting Stations**, see under METEOROLOGY.

**Synovial Membrane**, membrane covering the articular extremities of bones and the inner surface of ligaments entering into the formation of a joint. It secretes a clear lubricating fluid with an alkaline reaction. Synovitis is inflammation of the S. M.; it may lead to ankylosis (q.v.) or stiffening of the joint. See JOINTS.

**Syntesis**, see under JASTIA HILLS.

**Synthetic Materials**, preparations simulating a natural product. See CHEMISTRY; PLASTICS; RUBBER.

**Synthetic Rubber**, see under RUBBER.

**Syphilis**, chronic infectious disease generally contracted during sexual intercourse. It is contagious until the tertiary stage is reached. The origin of this disease is rather uncertain, but there are grounds for believing that it was introduced into Europe by Columbus's sailors who had contracted it at St. Domingo. Other names under which it has been known are the 'Neapolitan disease' and the 'Fr. disease.' At the end of the fifteenth century it spread through Europe in the form of a great epidemic. The name S. was first applied to the disease in a poem by Fracastorius, 1536. It was for long confused with gonorrhoea, even by the great John Hunter. It is characterised by various structural lesions, the most distinctive of which are the chancre, the mucous patch, and the gumma. A parasite (*Spirochaeta pallida*), present in the lesions, was shown by Schaudinn and Hoffmann in 1905 to be the cause. Being generally a sexual matter, the most common situation for its appearance is the genital organs, but the germ may enter any abraded surface on the body. An abraded surface, however, is not essential, as the virus can easily penetrate the delicate, soft, and moist mucous surfaces upon which chancres are commonly found. The earliest manifestation of acquired S.

is the chancre or primary sore which appears between two and six weeks after the disease is first contracted. It usually takes the form of a reddish-brown pimple with an ulcerated summit and an indurated base which, when pressed between the finger and thumb, has a cartilaginous feeling. Following the appearance of the chancre, the nearest lymphatic glands swell and become hard. The mucous patches are formed upon mucous membranes, often in the mouth or throat, or in situations where two skin surfaces are constantly in contact. They are slightly elevated patches usually covered by a thin whitish membrane. The gumma is a rounded tumour of varying size. Its usual situations are the periosteum of flat bones, the membranes of the brain, the testicle, liver, and spleen. It contains a gummy material and is generally soft to the touch.

There are three stages in the course of the disease: (1) the primary (*primary S.*), distinguished by the presence of the chancre; (2) the secondary (*secondary S.*), by the mucous patches, sore throat, and swelling of the glands; often there is a faint mottled rash on the skin, or the rash may assume other forms, so that S. has well been called the 'great imitator'; and (3) the tertiary (*tertiary S.*), by the gumma and skin lesions. A period of six to nine weeks intervenes between the appearance of primary S. and that of secondary S. No definite time can be fixed for tertiary S., as it is extremely variable. After seven years (ten to twenty) there may appear a fourth stage, when the disease may attack the central nervous system, causing locomotor ataxia, insanity, and paralysis; or there may be disease of the aorta (e.g. aneurysm) or of the heart. S., other than that acquired through sexual connection, is known as *non-venereal* or *S. insontium* (S. of the innocent). Forms of non-venereal S. may be *congenital*, *economic* (i.e. that form contracted by using contaminated materials, e.g. a towel formerly used by an affected person, though many authorities deny that S. can be so transmitted, and also by casual contact with a syphilitic), or *technica* (i.e. that form acquired by those attending on syphilitics, e.g. doctors, nurses, and midwives). The proportion of those suffering from S. and gonorrhoea has been estimated as high as 10 per cent of the total pop. in industrial dists.

As a cure for S. mercury and iodides have been used, but these have been to a large extent superseded by a marvelous chemical compound discovered by Ehrlich with the assistance of S. Hata (of Tokyo) and at one time known as *Ehrlich's Hata*. This is dioxidydiaminoarsenobenzenoldihydrochloride, registered as *Salvarsan*, and commonly called '606.' Neo-salvarsan, known as 914, is easier to administer than salvarsan, and is now commonly used in conjunction with either mercury or bismuth preparations and with penicillin. General paralysis of the insane, due to S., is treated by the introduction into the system of benign malarial parasites. After sev. attacks of fever the malaria

is treated by quinine. High temp. treatment without malaria can also be used. Treatment is controlled by the Wassermann reaction (W. R.) carried out on the blood or cerebro-spinal fluid. It may be added that treatment other than by a registered medical practitioner is generally useless and indeed illegal.

Candour on this question, and serious, intelligent study, will undoubtedly lessen its danger; and, more important still, may result in the uplifting of the general moral tone of future generations of young people, with a consequent growth of cleanliness of mind and body. In the period between the two world wars centres were estab. at local hospitals where free and confidential treatment was provided. Useful publicity was provided by the Brit. Social Hygiene Council. As always during wartime, S. increased between 1939 and 1945, and in the subsequent occupation of Germany, despite a nation-wide campaign by the gov. and prophylactic treatment by the military authorities. See also GONORRHOEA; VENEREAL DISEASES. See R. H. Kampmeier, *Essentials of Syphilology*, 1944; J. H. Stokes, *Modern Clinical Syphilology* (3rd ed.), 1941; and S. Lornholt, *Veneral Diseases in General Practice*, 1916.

**Syra**, or **Syros** (anc. Συρος), is. of the Gk. Cyclades in the Aegean Sea, having an area of 55 sq. m. Since the loss of its forests it has had a bare and rocky soil, with a sparse aromatic shrub suitable for pasturing sheep and goats. After the settlement of Gk. refugees the is. rapidly became populous. In spite of the competition of Pireus, Hermaeopolis (q.v.) is an important port. Pop. about 20,000.

**Syracuse**: 1. (It., *Siracusa*.) Fortified city and seaport, cap. of the prov. of S., Sicily, situated on the peninsula (formerly an is.) of Ortygia, 81 m. S.W. of Messina. It has a cathedral and other eccles. edifices, the ruins of Gk. and Rom. temples, catacombs, aqueducts, an amphitheatre, and quarries which were formerly used as prisons. There are also the remains of a Gk. theatre and a museum of antiquities. There is trade in salt, wine, chemicals, pottery, olive oil, asphalt, almonds, oranges, and lemons. Pop. 56,000.

In anc. times it was the wealthiest and most populous city in Sicily. It was founded c. 734 B.C. by a colony of Corinthians and other Dorians, led by Archias the Corinthian. During its greatest prosperity S. had two harbours. There were sev. stone quarries in S. The gov. was originally an aristocracy and afterwards a democracy until Gelon made himself tyrant of S. in 485 B.C. Under his rule and that of his brother Hieron, S. was raised to an unexampled degree of wealth and prosperity. Hieron was succeeded by his brother Thrasybulus in 467, but the rapacity and cruelty of the latter soon provoked a revolt, which led to his deposition and the estab. of a democratic form of government. The next important event was the siege of the city by the Athenians, which ended in the total destruction of the great Athenian

armament in 413. The democracy existed in S. until 406, when the elder Dionysius made himself tyrant. In the next two hundred years S. was ruled mainly by tyrants and then by kings. Hieronymus, who became king in 216 B.C. supported the Carthaginians against the Romans. A Rom. army under Marcellus besieged S. for two years (during which Archimedes constructed various engines of war) and captured it in 212. From this time S. became a tn. of the Rom. prov. of Sicily. In A.D. 878 the Saracens captured and looted the city, afterwards burning it to the ground. Although rebuilt the city never recovered its former importance. It suffered severely from earthquake in 1170 and 1693. In the Second World War sev. churches were damaged. S. was taken by the Brit. Eighth Army on the evening of the first day of the landing in Sicily, July 10, 1943.

2. City and port of New York State, U.S.A., cap. of Onondaga co., on the south shore of the lake of Onondaga, 147 m. W. of Albany. The Erie and Oswego canals connect it with the Great Lakes, the Hudson, and the St. Lawrence. It is the seat of a univ., and is a commercial centre of great importance. The chief manufs. include machine-shop products, soda ash and kindred products, farm tools, furniture, typewriters, motors, machinery, and woollen goods; minor industries are connected with chemicals, salt, and pottery. S. was formerly a great salt-producing centre. Pop. (1910) 206,000.

**Syr-Darya**, riv. of Turkestan, rises in the Tian Shan Range and flows in a N.W. direction for some 1,500 m. through the Kirghiz, Uzbek, and Kazakh S.S.R.s., emptying itself in the Aral Sea. The riv. has a large drainage area, its main trib. being on the r. b. The tribs. are used for irrigation and the S.-D. flows through the very fertile Ferghana depression. With the Angren-Darya the S.-D. is of importance since the two rivs. supply water to one half of the cultivated lands of the central Asiatic republics.

**Syria**, republic of Asia Minor, having the Mediterranean and Lebanon on the W., and bounded on the N. by Turkey, on the E. by Iraq, and on the south by Jordan and Israel. It was the Aram (or 'the highlands') of the ancients, and in a narrower sense implied only the region N. and N.E. of Palestine. Its surface is mainly plateau, gently dipping from the Lebanon and Anti-Lebanon ranges (6000-10,000 ft.) towards the Arabian Desert. The Orontes flows northwards from the Lebanon range across the N. boundary to Antioch (Turkey), the Euphrates crosses the N. boundary near Jerabhus and flows through N.E. S. to the frontier of Iraq. In 1925 two of the original five ters., Damascus and Aleppo, were united to form the single state, now republic, of S. (comprising the sanjaks of Hama, Hems, Damascus, Houran, Aleppo, Deir ez Zor, and the autonomous sanjak of Alexandretta). In 1939 the sanjak of Alexandretta was ceded to Turkey. The ters. of Alawiyya (formerly the sanjaks of Latakia and Tartus) and of Jebel Druse



(S.E. of Hauran) became part of the Syrian Republic in 1942, the ter. of the Lebanon (sanjaks of N. Lebanon, Mt. Lebanon, S. Lebanon, and Bekaa) forming a separate independent republic. S. is divided into the mahafazets or administrative dists. of Damascus, Hama, Hems (Homs), Hauran, Aleppo, Euphrates, Druse, Latakia, and Jezirch.

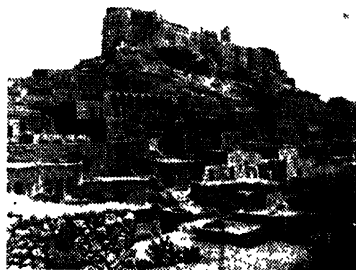
S. is a member of the United Nations and of the Arab League. The constitution provides for a single-chamber legislative Assembly, elected by direct vote. The president of the republic is elected by the Assembly and the executive power is exercised by a ministry formed from the predominant party in the Assembly. The area of S. is estimated at 55,700 sq. m., and the pop. numbers 2,860,400 (including Latakia, 432,500, and Jebel Druse, 80,000). The people are mainly Moslem, two-thirds being of the Sunni sect. The Druses number about 89,800, the Alawiyya 335,500, and Ismailians 29,900. Christians number over 419,500, of whom 14,000 are Maronites, 143,000 Gk. Orthodox, and the rest Gk. Catholics, Armenian Orthodox, Syrian Orthodox, etc. There were also 30,600 Jews in 1946. After the Second World War some 34,000 Armenians left S. and the Lebanon for Soviet Armenia. There are over 820 state schools and a number of private and foreign schools, the number of pupils being about 165,000. At Damascus there is a Syrian univ. (founded 1923) and a teachers' training college. There are also two univs. in Beirut, one Fr. and one Amer., each containing a faculty of medicine. A college of engineering was estab. in Aleppo in 1946-47. There are also an Arab academy and an agric. college at Sclennyeh.

S. is primarily agric., most of the pop. working on the production of cereals (wheat, barley, maize) sorghum, sesame, and cotton; olives, fruits, etc., are also grown, and cattle breeding is also a leading activity. Tobacco (*latakich*) is grown in Sahel and in the Sahyoun and Djebel dists. The industries are few, including silk thread, flour, olive oil, soap, tanning, textiles, and tobacco. The centres of the silk industry are Beirut (Lebanon), Aleppo, Tripoli, and Latakia. Skins and hides, leather goods, and copper and brass utensils are locally produced. Mineral wealth is small, but there are indications of sev. deposits. Oil boring was begun near Tripoli; manganese ore, bitumen, and sodium chloride are produced. The chief exports are fruit and vegetables, textiles, animal products, and tobacco. Owing to the closely linked economic interests of S. and the Lebanon, a Council of Common Interests was estab. in 1920 and reconstituted in 1943. The chief tns. of S. are Damascus (the cap.), pop. 250,000; Aleppo, 255,000; Hems, 100,000; Hama, 50,000; Latakia (Lattakieh), 35,000. The chief tn. of Jebel Druse is Souaida, built a century ago by Lebanese refugees from the stones of the ruined Nabataean city of Soda, together with local basalt. The chief tns. of Lebanon are Beirut (the cap. and prin. port of the whole area), 134,700; Tripoli, 72,000; Sidon, 20,000; Zahlah, 20,000;

and Tyre, 6000. There is a narrow-gauge railway from Beirut to Damascus connecting at Rayak with the standard-gauge line which runs from Tripoli (Lebanon) through Homs, Hama, and Aleppo to the Turkish border and from Nusaybin to the Iraqi border. From Damascus the Hejaz railway runs south to Jordan. Air services, mainly to Damascus, are operated by Brit. Overseas Airways, Pan-Amer., Middle East Air Lines (Lebanese), the Egyptian Misr Air Lines, and the Fr. Compagnie Générale Transatlantique.

The Syrian Army in 1949 numbered 10,300; there was also a desert force of 800, a police force of 1500, and a gendarmerie of 5200. A small air force also exists.

*Archæology and Art.*—S. possesses a large number of important archæological remains which have thrown much light



Syrian Legation

SYRIA: THE ANCIENT TOWN OF SAIDNAYAA

on the prehistory of W. Asia. The Neolithic culture represented in some early sites of S. (i.e. in the lowest levels of Tell er-Judeidch in the plain of Antioch) must be at least as early as 5000 B.C. and probably is even much earlier. The following Chalcolithic (or 'Copper-Stone') Age is represented by the culture of Tell Halaf (on the Khabur), the first truly great culture of auct. times. Remains of this culture have been found also at Carchemish (over 100 m. W. of Tell Halaf). The most distinctive product of this culture was its superb polychrome pottery, for which a genuine glaze paint was used. Parrot's excavations (1933-38) at Mari (modern Tell Hariri on the Middle Euphrates, near the Iraq frontier), where over 20,000 cuneiform tablets of the Amorite kingdom were recovered (eighteenth century B.C.), constitute a discovery of the greatest importance. M. P. Montet's excavations at Byblos (Jebail) have disclosed relics of the same epoch (actually the appearance of this culture goes back to c. 1900 B.C.), but of definite Egyptian inspiration. From the point of view of hist. W. S. holds a unique place: at Byblos Dunand has discovered (since 1929) about a dozen inscriptions written in a hitherto

unknown syllabic script (*see under Writing*) of the early second millennium B.C.; at Ras Shamra (anct. Ugarit), also N. Syria, since 1929, hundreds of tablets have been discovered, written in a previously unknown cuneiform alphabet (*see under ALPHABET*) of the fifteenth-fourteenth century B.C. Finally, the earliest known examples of the N. Semitic alphabet (*q.r.*), the prototype of all the alphabets, were discovered at Byblos; they belong to the end of the second millennium B.C. Of the early first millennium B.C. are the Hittite remains of Carchemish, Senjirli, Hamath, and other places, each a milestone in anct. hist., containing buildings, carvings, and bas-reliefs springing from Hittite and Mesopotamian influences. The old Aramaic inscriptions from Tell Halaf, Ahs (S.W. of Aleppo), Sujin (S.E. of Aleppo), and Senjirli of the same period are milestones in the hist. of Semitic epigraphy. The Greco-Rom. period is represented by the famous Baalbek or Heliopolis, with its gigantic temples, and the synagogue discovered at Dura Duropus (*see under SYNAGOGUE*). S. is rich in examples of early Christian eccles. buildings such as the impressive ruins of the Sergius cathedral in Rnsafa. An important monument is the church of St. Simcon Stylites at Qalat Siman, built a few years after his death.

*History.*—The inhab. of S. were of Semitic origin, of the same stock as the Hebs. At the beginning of the Heb. monarchy S. was divided into a number of petty kingdoms, frequently at war with Israel. As the great Assyrian kingdom developed S. weakened, and Damascus was destroyed by Tiglath-Pileser, king of Assyria, who conquered all S. about the middle of the eighth century B.C. After having successively been a part of the Assyrian, Babylonian, Persian, and Macedonian empires, S. once more became powerful under the rule of Seleucus Nicator (312 B.C.), with Antioch for its cap. Its strength was further increased by Antiochus the Great; it was then that Palestine became a Syrian prov. In 66 B.C. (after the destruction of the kingdom of S. by Tigranes), S. was added by Pompey to the possessions of the republic, and became a Rom. prov., and as such it is mentioned in the N.T. Much later Zenobia, queen of Palmyra, endeavoured to make S. the seat of empire. The Rom. emperors had a difficult task to defend S. from Persian incursions. When the Rom. Empire was divided S. was included in the Byzantine Empire until 636, when it was conquered by the Saracens, who held it during the crusades. S. later fell into the hands of the Egyptians, was overrun by the Mongol hordes in 1290, and its destruction was consummated by the Turks, who overthrew the Egyptians in 1516, from which time it remained a Turkish prov. During the First World War S. was taken from Turkey by allied troops under Allenby. In 1919 an independent state was (stab.), and the Emir Feisal, son of King Hussein of the Hedjaz, was proclaimed king of S. Hostilities between

the Fr. and the Arabs overthrew this independence, and compelled recognition of the mandate which had been assigned to France by the Allied Council at San Remo (April 1920), and confirmed by the League of Nations (1922).

The mandate did not come into full force until Sept. 1923. Great Lebanon, which had been proclaimed a state since Sept. 1920, was reorganised as the Lebanese Republic. In 1925 the Fr. united the provs. of Damascus and Aleppo to form the Syrian Republic. By a statute of 1930 S. was made a republic with a Parliament elected for four years and a president with certain specified powers. The Jebel Druse had been in revolt from Aug. 1925 to March 1927, and was now made a component part of the republic of S., but continued under a separate administration. The same applied to Alawiyya (Latakia).

*British Invasion (1941).*—The fall of Crete involved a threat to S., and it was generally expected that the next Ger. move would be an attack on Cyprus as a preparation for the eventual subjugation of S. as part of a pincer movement by way of S. and Egypt against India, via Iraq. By mid 1941 there had long ceased to be a large Fr. Army in S., while such Fr. troops as then garrisoned the country were pro-Vichy and not unlikely to oppose a Brit. attack.

The avowed purpose of the Brit. invasion of S. was to put an end to the infiltration of Ger. agents, with the connivance of the Vichy Gov., and to prevent the estab. of Axis bases. Operations began on June 8, 1941, and allied mechanised columns were soon advancing towards Damascus. By June 12 Free Fr. forces reached the southern outskirts of Damascus, while allied troops advancing on Beirut along the coastal road occupied Sidon. It was soon evident that Vichy's hold on Gen. Dentz, Fr. high commissioner in S., and the latter's hold on his troops, were too tight to allow of temporising methods, and a raid on the Brit. communications at Kuneitra and Merj Ayoun showed that serious opposition was to be expected. But on June 21 the allied troops were beginning to march into Damascus, while Brit. motorised forces from Iraq were entering Palmyra, on the oil pipe-line running through S. to Tripolis. The occupation of Damascus, however, was potentially less important than the reoccupation on June 24 of Merj Ayoun, a place of great strategic importance. At the beginning of July the allied coastal drive N. towards Beirut was impeded by the giant gorge running south of the Vichy stronghold of Damour. Beirut, however, was surrendered on July 12. The strategical results of the capitulation were appreciable: the Gers. were deprived of a valuable base of operations against the Iraqi oilfields; Cyprus and Turkey were no longer isolated; Russia's flank in the Caucasus and their great oilfields there were covered; and allied prestige among the Arabs rose sharply while that of Vichy suffered a severe blow. In accordance with the undertaking given by the Brit. and Free Fr. forces S. and

Lebanon were declared independent. But the conclusion of the war in 1945 brought a repetition of the trouble which arose at the end of the First World War. Early in that year the Fr. claimed that their rights in S. were 'predominant,' and a Fr. general went to Beirut to present Fr. proposals to the two states. A Fr. cruiser and additional Fr. troops also arrived, with the result that the Lebanese and Syrian Govs. refused to negotiate, and fighting broke out between the Fr. troops and the Syrian and Lebanese gendarmerie. Britain intervened to prevent further bloodshed and to safeguard security in the Middle E., and soon afterwards the Fr. commander ordered the cease fire. The evacuation of the whole country by all foreign troops in April 1946 marked the complete independence of S. and Lebanon.

S. and the Lebanon joined in the general Arab attack on Israel, but the Transjordan-Israel agreement of Dec. 1948 paralysed what little initiative still remained to them, and they joined the general armistice of Feb. 1949. There was widespread popular discontent over the mismanagement of the war, the neglect of promised reforms, and the continuance of the visa restrictions and customs barriers against other Arab states, and on March 30 the army, under Marshal Husni Zaim, carried out a bloodless revolution, arresting the president and his ministers, and holding a plebiscite under which, without pressure, Husni Zaim was elected president. Far-reaching reforms were initiated, involving the transfer of power from the feudal families to the middle classes, the div. of large estates, the reduction of the bureaucracy, and a limited enfranchisement of women. Husni Zaim, however, antagonised the neighbouring states, as well as the Syrian commercial classes and the army, and two groups of the last rose against him. He was shot on Aug. 14 by a group of officers under Col. Sami Hanawi. The military junta, headed by Hanawi, immediately disclaimed any idea of retaining power, and called a meeting of political leaders. A provisional gov. was then formed with Hushem Bey Atassi, a notable of Hems, as Prime Minister. In this new gov. four ministries were assigned to members of the Popular party, which has always been in opposition. The Ministry of Finance and three seats without portfolio were given to members of the National party, which had been in power since 1941. The other ministries were divided among independents. See also DEAD SEA; JORDAN; LEBANON; PALMYRA; PALESTINE. **Bibliography.**—TRAVEL AND TOPOGRAPHY: Gertrude Bell, *Syria: the Desert and the Sown*, 1907; H. Pirio-Gordon, *A Guide-book to Central Syria*, 1920; Christina P. Grant, *The Syrian Desert: Caravans, Travel, and Exploration*, 1937; Helen C. Gordon, *Syria as it is*, 1939. HISTORY: Sir W. M. F. Petrie, *Syria and Egypt*, 1898; E. S. Bouchier, *Syria as a Roman Province*, 1916; A. Gruvel, *Les États de Syrie*, 1931; A. T. Olmstead, *A History of Palestine and Syria, to the Macedonian Conquest*,

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**Syriac Language and Literature.** Syria and Syrians were the Gk. terms for biblical Aram and Aramaeans. From the philological point of view Syriac is Aramaic, in its later stage, as spoken by the Christian pop. of SYRIA (see under SEMITES and SEMITIC-HAMITIC LANGUAGES). Syriac was then the language and script of the extensive Syriac literature, which is a Christian literature in a very special sense, all original documents dealing exclusively with Christian matter. Syriac script was an offshoot of a cursive Aramaic writing, perhaps of the Palmyrene cursive in its early stage (see under ALPHABET).

The grammar of Syriac is in general fairly simple. The syntax of Syriac resembles in general characteristics that of Heb. As regards phonology, Syriac tends to shorten Heb. long vowels and to substitute dentals for sibilants.

Edessa (in Syriac Ur-hai, now named Urfa), in N.W. Mesopotamia, was the only centre of the early Christian period where the language of the Christian community was other than Gk. Christianity was preached there in the second century; the city became the Christian metropolis of E. Syria, and from here the Christian faith spread to Persia (*q.v.*), where it adopted the Edessan Syriac as the language of the Church, of literature, and of cultivated intercourse. The same dialect was also adopted in the valley of Euphrates as a *lingua franca*, was used far and wide, and became after Gk. the most important language in the E. Rom. Empire. One of the earliest trans. of the Bible, the *Peshito* or *Peshittā* (pure, simple) was made in Syriac about A.D. 200.

The splitting up of the S. I. and L. into the various branches was a direct result of the religious and political situation of the whole E. Christianity, which was riddled with sects, heresies, and schisms.

Bardaisān, or Bardesanes (*d.* 222), a philosopher, may be considered as the first great Syriac writer. Aphrahat or Aphraates (*f.* 336-45), a great theologian, of Persian origin, wrote numerous *memrē* or dogmatic and theological homilies. The greatest of the early Syrian fathers was St. Ephrem (Ephraim), known as Ephrem Syrus, who lived before, and shortly after, 393. He was a voluminous writer of commentaries, homilies, and poetical treatises of various sorts. In the fifth century begins the vernacular Syriac historical literature. It was about this time that the pure Syriac language began to be corrupted by the importation of Gk. loan words, while Hebraisms also began to creep in. Isaac the Great of Antioch (*d.* c. 460), like Ephraim, wrote a very large

number of works, all of a religious tendency, and also like him wrote much verse. Also the contemporaneous Bālay wrote hymns and other poems. St. Simeon Stylites, the Older (c. 388-459), is remembered chiefly on account of Tennyson's poem. Meanwhile, the Syriac Church was torn with internal conflicts, which are reflected in the writings of the sixth and seventh centuries. Rabbūla and Hībūa or Ibas (bishops of Edessa), Bābhōy or Barsawmā, Narsay and his disciple Joseph Hūzāyā, of Nisibi, the *catholikos* Mār Abhā (d. 552), Jacob of Serūgh, Flloxenus of Mabbūgh, Joshua Stylites, Sergius of Ras'ain (fl. sixth century), John of Asia (b. c. 505), and Jacob Baradaeus of Edessa (b. c. 640), the Monophysite, are important names of the great age of Syriac literature. But with the great schism in the seventh century between the Nestorians and the Jacobites a separation took place, which implied a severance of tradition in the literature which emanated from the two sects. Ishō'yahb II. and Ishō'yahb III. (d. 657), Simeon of Rēwardāshir, Ishō'bōkht of Rēwardāshir, the monastic historian, and Thomas of Margā, however, deserve mention here. But Syriac literature never regained its former glory. From the seventh century onwards Arabic everywhere put a speedy end to Syriac, which, however, has remained in use for liturgical purposes, and until recently was still spoken in a few vils. near Damascus and in Lebanon, as well as near Lake Urmia (Persian Azerbaijan). Bar-Ihebreus (fl. thirteenth century) tried to revive the Syriac language.

About 1840 Amer. Protestant missionaries, using the old Nestorian script, reduced to writing the E. Syriac or neo-Aramaic dialect of Urmia, where they founded the first printing press. Over thirty-five years ago two Catholic missions (of the Lazarists and of the Dominicans) reduced to writing the Syriac dialects still spoken in the plain of Salamas and of Mosul. Still more recently a periodical paper in 'Assyrian' was pub. in Tiflis.

**Syringa**, genus of Oleaceae, contains ten species which grow in Europe and Asia. The best known of these is *S. vulgaris*, the common lilac, often grown in Britain. The name of *S.* is also popularly given to sev. shrubby plants in the saxifragaceous genus *Philadelphus*, particularly the mock orange (q.v.).

**Syrinx**, see PANDEAN PIPE.

**Syros**, see SYRA.

**Syrtis**, or Syrtis, classical name of two dangerous gulfs, the S. Major and the S. Minor, in the Mediterranean, off the shores of N. Africa. S. Major (gulf of Sidra) is a wide and deep gulf on the Libyan and Tripolitanian shores facing the Adriatic between Sicily and the Peloponnesus. S. Minor (gulf of Khabs) lies in the angle between the E. coast of Zeugitana and Byzacena (Tunis) and the N. coast of Tripolitana (Tripoli).

**Syrup** (from Arabic *sharab*, drink) indicates primarily a saturated solution of

sugar. For fruit *S.* see under PRESERVING.

**Systole**, see under HEART, Cardiac Cycle and the Circulation.

**Szyzgy** (from Gk. *συνγυα*, a yoking together, astronomical term denoting either of the two positions of the moon when it appears to be in a line with the sun, i.e. the new or the full moon.

**Szabadka**, see SUBOTICA.

**Szatmar-Nemethy**, or Satu Mare, cathedral city of Rumania on the Szamos, 68 m. N.E. of Debreczen. It trades in pottery, linen, and wine. Pop. 53,000.

**Szczecin**, see STETTIN.

**Szceziniek**, see NEUSTETTIN.

**Szechwan**, or Szechuan ('four rivs.'), prov. of China, lying in the W. The highlands in the W. rise to 19,000 ft. and the N. is also mountainous, but over the E. and centre stretches a broad and fertile plateau, where cereals, sugar, tea, rice, oranges, rhubarb, and tobacco are grown. The prov. is well watered by the Yangtze in the south and elsewhere by its large tribs., the Fusing-ho, Minkiang, and Kialingkiang, which all rise in the N.W. There is considerable commerce in salt, timber, copper, coal, and white wax. Gold, lead, silver, antimony, and iron are mined, and the mineral wealth is potentially large. Lubricating oils are produced from the tung-nut tree which grows abundantly in the prov. Chengtu is the cap., and, like Tungchwan, is an important trade centre. Chungking stands on the Yangtze. A motor road to the N.W., connecting S. with Sinkiang and running through the latter prov. to the Turkestan-Siberian railway, is under construction. Wanhien is another river port. Area 144,959 sq. m. Pop. 47,108,000.

**Szegedin**, or Szeged, second largest city of Hungary, and chief centre of the Alföld, at the junction of the Theiss with the Maros, about 100 m. S.E. of Budapest on the Yugoslav frontier. After the disastrous flood of 1879 the tn. was rebuilt. It has a univ., technical high school, museum, theatre, and court of appeal. In the industrial suburb on the l. b. of the Theiss are manufs. of cloth, salami, hemp, wood, leather, tobacco, and cement. There is trade in cattle and grain. The city has an airport. Pop. 136,800.

**Szent-Györgyi, Albert** (b. 1893), Hungarian biochemist, b. in Budapest, from 1930 prof. at the univ. of Szegedin. He discovered vitamin C in paprika, and received the 1937 Nobel prize for chem. His work on cells and in other fields is also of great importance.

**Szymanowski, Karol** (1883-1937), Polish composer, b. at Tymoszwowska in the Ukraine. He studied at the Warsaw conservatory, where he was conductor from 1919 to 1930. He is regarded as the most distinguished Polish composer since Chopin. At first influenced by Debussy, he arrived at a mastery which showed itself in skill of form and clarity as well as in his love of folk-music. He wrote three symphonies, two violin concertos, two operas, many songs, seven settings of poems, and other works.

# T

**T**, twentieth letter of the Eng. alphabet, was the nineteenth letter of the Gk. and the Lat. alphabets. It was the twenty-second and last letter of the N. Semitic (including Phœnician) alphabets, as it is in modern Heb. It is a voiceless dental explosive. The earliest form of the letter was X or +, and the Semitic name for it is *tau*, which means 'mark' or 'sign.' In early Gk. MSS. it is written τ, which came to be written T, its final form. In science T usually represents temp. on the Absolute scale, and *t* temp. on the Centigrade scale. In chem. Ta, Tb, Te, Th, Tl, and Tm are the atomic symbols for tantalum, terbium, tellurium, thorium, thallium, and thulium respectively.

**Taal**, *ta*, in the prov. of Batangas, Luzon, Philippine Is., on the strip of land between Lake Bombon and the gulf of Balayan. It is the centre of an agric. region which produces rice, Indian corn, cocoa, and cotton. Pop. 35,000.

**Tabard** (Fr. *tabarre*, from Low Lat. *tabardum*), garment worn by knights over their armour until about the mid sixteenth century, which fitted closely to the body, was open at the sides, had wide sleeves or flaps reaching to the elbow, and displayed the armorial ensigns of the wearer on the back and front. It is also the term used for a herald's coat blazoned with the arms of his sovereign, and for a similar cloak worn by the trumpeters of the Household Cavalry.

**Tabariyeh**, see **TIBERIAS**.

**Tabasco**, S. state of Mexico, bounded on the N. by the gulf of Mexico, on the E. by Campeachy and Guatemala, on the S. by Chiapas, and on the W. by Ver. Cruz. The surface is flat and the soil fertile, yielding cacao, sugar, coffee, tobacco, rice, and fruit. Oil is found. The chief tns. are Villa Hermosa (cap.) and the port of Puerto Alvaro Obregón. Area 9782 sq. m. Pop. 285,600.

**Tabernacles, Feast of** (Heb. *Sukkoth*, huts, or *hag ha'asiph*, feast of Ingathering), Jewish festival, celebrated from the fifteenth to the twenty-third of Tishri (*q.v.*), and commemorating on one hand the dwelling of the Israelites in the wilderness, and on the other hand the anct. custom of living in improvised huts, especially during the grape harvest.

**Tabernacle**, *Tab* (Lat. *tabernaculum*, diminutive of *taberna*, booth, hut, temporary dwelling, etc.), term generally applied in the Scriptures to the portable sanctuary of the Jews, which was erected by Moses, and which is described fully in Exod. xxv. xxvii. and xxxvi.-xxxviii. It was a tent constructed with extraordinary magnificence in every part, and it measured 150 ft. by 75 ft. It contained two main chambers, an outer and an inner. The latter, called the Holy of Holies, contained the Ark of the Covenant

and the mercy seat. The altar of incense, the table of shewbread, and the golden candlestick stood in the outer chamber. An altar of burnt offerings and a laver for the washing of hands stood in the outer yard. The tents of the priests and Levites surrounded it in appointed order. The Israelites carried the T. with them throughout their wanderings in the wilderness.

**Tabes Dorsalis**, see **LOCOMOTOR ATAXIA**.

**Tabes Mesenterica**, tuberculous disease of the mesenteric glands, lymphatic glands of the mesentery, a fold of the peritoneum connecting the intestine with the posterior abdominal wall. The disease usually occurs in children, and is characterised by progressive wasting, while the abdomen may become much enlarged through the glands being filled with masses of caseous tubercular matter. Surgical treatment and attention to hygienic conditions may result in a cure.

**Tablat**, see **ST. GALL**.

**Tablature**, various old systems of writing down music, especially for organ and for lute, without notes, but by means of letters, numbers, or other signs. Only the ukelele and similar guitar types still use a T. notation, though the tonic sol-fa notation may be said to be a kind of T.

**Table Bay**, inlet of the Atlantic in the S.W. coast of the Cape of Good Hope. It was formerly called Saldanha Bay from Antonio de Saldanha, the first European to land there (1503). Cape Town lies on the S. side.

**Tableland**, see **PLATEAU**.

**Table Mountain**: 1. Or **Tafelberg**, mt. of the Cape Peninsula, overlooking Cape Town and Table Bay. The level top gives it the appearance of a table and it is often covered with a dense white cloud called 'The Tablecloth.' Its height is 3582 ft. 2. Mt. in Natal between the Inanda and Umgeni Rs., E. of Pietermaritzburg.

**Table Tennis**, or **Ping-pong**, form of indoor lawn tennis. The standard table measures 9 ft. by 5 ft., with a 6-in. high net. The bats may be of any weight or size, provided they are not white and do not reflect; rubber-covered wood is generally used. The balls weigh between 2.4 and 2.53 gm., and are of celluloid. The game is for two or four players; each serves five times successively, and no volleying is allowed. The game of 'ping-pong' was very popular from 1899 to 1904, and was revived in 1921. International tournaments are held, twenty-eight countries competing in 1948 at Wembley. See J. Carrington, *Table Tennis*, 1950.

**'Tablet, The'**, official organ of the Rom. Catholic Church in England. It was founded by Frederick Lucas in 1840.

**Tabley**, John Byrne Leicester Warren, Baron de, see **DE TABLEY**.

**Taboo**, see **TABU**.

**Tabor:** 1. Tn. of Bohemia, Czechoslovakia, on the Luznica, 65 m. S. of Prague. It was founded by and long formed a stronghold of the Hussites. There are spinning mills, machine shops, and tobacco factories. Pop. 16,000. 2. Arabic *Jebel-el-Tor*, mt. in Galilee (1843 ft.), 7 m. E. of Nazareth, a dome-shaped mass rising abruptly from the plain. It is the traditional scene of the Transfiguration. The summit is divided between the Orthodox and the Franciscans, each possessing a church and conventual buildings, and the latter a hospice. The Franciscan church is a magnificent modern basilica on the site of the medieval church built in the N. Syrian style of the sixth century by Barluzzi, the architect of the Franciscan basilica of Gethsemane.

**Tabor** (O.F. *tabour*), small drum used to accompany a pipe or fife. It is somewhat larger than a tambourine, and is carried on the wrist of the player, and beaten with a single drum stick.

**Tabora**, tn. in the centre of Tanganyika, 210 m. E. of Ujiji, the headquarters of the W. Prov. In addition to gov. buildings there are European and native hospitals, and gov. and mission schools. There is an aerodrome 1 m. E. of T., and also large railway workshops. T., founded by Arabs about 1820, was formerly a great centre of trade in slaves and ivory; to-day it is important as a trade centre for native produce. From T. a branch line runs to Mwanza, the chief S. port on Lake Victoria. Pop. (dist.) 530,000 native; (tn.) 30,000 native, 160 European, 4800 Asiatic.

**Taborites**, see under HUSSITES, WARS OF THE.

**Tabriz**, anct. city, cap. of Azerbaijan, and a commercial centre of Persia, on a small riv. called Aji Chay running into Lake Rezaïeh. T. is situated 350 m. N.W. of Teheran, and is one of the main industrial centres of Persia. The carpets manufactured here are of fine designs and quality and are well known all over the world. There are two match and two leather factories and a few engaged in weaving and spinning. A univ. was estab. in 1946. Because of its strategic importance, it has been repeatedly invaded and occupied by other nations, mostly by Ottomans, Russians, and Turks. Earthquakes have ruined the city sev. times and its historical buildings have been wiped out. It was the cap. of Persia in the time of Shah Ismail I. and Ghazan Khan. There are many mosques and many caravansaries which indicate its hist. as a commercial centre. T. is connected by rail with Julfa (85 m.) on the Russian border, and a new line is under construction from Teheran to T. Pop. 214,000.

**Tabu, Taboo, Tambu, or Kabu**, word of Polynesian origin, meaning very marked, marked off, severely prohibited, reported by Capt. Cook, who says that it 'has a very comprehensive meaning; but, in general, signifies that a thing is forbidden' (*Voyage to the Pacific Ocean*). In Polynesia the word T. was applied in all cases where things were not to be touched,

because they were regarded as dangerous in a magic-religious (supernatural) sense, and so must not be lightly approached, but should be marked off from common use or contacts. T. is not confined to Polynesia, but is found in America, Africa, and elsewhere, even among civilised peoples. T. may refer to persons (kings, priests, chiefs), places, things and animals, events, time (day of the week, season of the year; time for hunting, fishing, or war; feasts), illness or death, sex, totem, etc., having 'dangerous' supernatural qualities. Such experiences as birth, initiation, marriage, and sexual practice are brought under its operations with the aim of protecting them against hostile influences. For this reason the anct. Israelites, for instance, regarded dead bodies as 'unclean' (Num. xix. 11, 13 ff.). A specially comprehensive system of T. is enforced against women during menstrual periods, and women who are pregnant are similarly protected. The meaning of T. is similar to that of Lat. *sacer* or Gk. *ἅγιος*. Some words may not be spoken; they are 'sacred' or 'tabooed'. The word has passed into Eng., but without the notion of awe. Thus we may 'taboo' politics or teaching on sex in schools. See G. Turner, *Samoa a Hundred Years Ago and Long Before*, 1884; W. W. Skeat, *Malay Magic*, 1900; A. von Gennep, *Tabou et totémisme à Madagascar*, 1904; J. G. Frazer, *The Golden Bough*, vol. iii. (*Taboo and the Perils of the Soul*), 1911; S. Freud, *Totem and Tabu*, 1913; R. Marett, *The Threshold of Religion*, 1914; H. Webster, *Rest Days*, 1916; and F. R. Lehmann, *Die polynesischen Tabusitten*, 1930.

**Tabuco**, see CARUBUS.

**Tabular and Non-Tabular Deposits**, see under MINING.

**Tabulating Machines**, see HOLLERITH  
**Tacheometry**, see under SURVEYING AND LEVELLING.

**Tachira**, state of Venezuela, with Colombia to the W. and S., Zulia to the N., and Merida and Barinas to the E. The Uribante R. rises in it and flows through the state. Agric. products include coffee and cocoa, petroleum is produced, and silver, iron, coal, and copper are mined. San Cristóbal is the cap. Area 4284 sq. m. Pop. 246,000.

**Tachygraphy**, see under SHORTHAND.

**Tachylite**, see under LIGNEOUS ROCKS.

**Tacitus** (c. A.D. 55-120), Rom. historian, b. perhaps at Terni, whose full name was either Publius or Gaius Cornelius T. He studied rhetoric, and became an eminent pleader, being first promoted by Vespasian and receiving further marks of favour from that emperor's sons, Titus and Domitian. In 78 he married the daughter of Agricola, governor of Britain. He was quaestor c. 80, praetor in 88, senator under the terror of Domitian, consul in 97-8 under Nerva or Trajan. He served as colleague of the younger Pliny in the prosecution of Marius Priscus in 100, and as proconsul of Asia c. 112-13, after which our information fails. Among Pliny's letters are eleven addressed to T., who was his intimate friend. T.'s extant works include *Dialogus de Oratoribus* (c.

80), a pessimistic treatise on the decline of rhetoric; *Agricola* (98), a biography of his father-in-law; *Germania* or *De origine et situ Germanorum*, a valuable ethnographical work; *Historiae*, a hist. of the empire from Galba to Domitian (69-96), in twelve or fourteen books, of which only i-iv. and part of v. remain; *Annales* (115-17), a hist. of the empire from the death of Augustus to that of Nero, of which books vii.-x. are lost, also parts of v., xi., and xvi.

His style is splendidly forceful, condensed, and epigrammatic, and has been compared to that of Sallust, but its art goes far deeper. The moral dignity of T. is impressed upon his works; his power derives largely from his knowledge of the human mind and its motives; and for this study he found abundant materials in the hist. of the emperors, particularly Tiberius. Later his style becomes more gloomy, while his use of rhetorical devices increases. He remains the most trustworthy witness of the great age from the death of Augustus to Domitian.

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**Tack**, in Scots law, the technical name for (1) a lease whether of land or offices; (2) any contract under which something is let for hire.

**Tack**, rope, wire, etc., used to secure the windward clews or corners of the courses to the ship's side, and the windward lower end of a fore-and-aft sail amidships. Also in all triangular sails and in those four-sided sails where the head is not parallel to the foot, the foremost corner at the foot is called a T. A ship is said to T. when the Ts. are shifted and the yards braced, and the ship's head turned to the wind, so that she shall sail at the same angle to the wind on the other side; thus by alternate Ts. a ship proceeds against the wind in an oblique direction, or 'beats to windward.'

**Tacna**: 1. Southernmost dept. of Peru, in the angle between the Pacific coast and the Chilean frontier. It is generally a wilderness, cultivated only in the valleys. T. was retained by Chile in 1883, this leading to the long-drawn-out T.-Arica dispute (see under PERU). Area 4930 sq. m. Pop. 37,000. 2. Cap. of the above on the T. R., 39 m. N. of Arica in Chile. Tobacco and sulphur are produced. Pop. 11,400.

**Tacoma**, cap. of Pierce co., Washington, U.S.A., at the head of Puget Sound. It

has an excellent harbour, and is one of the prin. ports on the Pacific coast. There is an important export trade in lumber, flour, fish, etc., and there are foundries, railway workshops, meat-packing estab., etc. It is the chief W. terminus of the N. Pacific Railway. T. was estab. in 1868 as Commencement City. Pop. 109,000.

**Tacoma, Mount**, see RAINIER.

**Tacsonia**, genus of climbing plants (family Passifloraceae), with deeply lobed leaves and an elongated tubular calyx, a feature which distinguishes them from the genus *Passiflora*.

**Tactics**, see STRATEGY AND TACTICS.

**Tacuarembó**: 1. Dept. of Uruguay, with Salto and Paysandu on the W., Rivera on the N.E., and the Rio Negro as the S. border, watered by sev. tribs. of that riv. Cattle are reared. Area 8110 sq. m. Pop. 106,000. 2. Cap. of the above, on the railway into Brazil, trades in hides, skins, and wool. Pop. 30,000.

**Tadcaster** (Rom. *Calcaria*), tu in the W. Riding of Yorkshire, England, on the R. Wharfe, 9 m. W.S.W. of York, on the site of a Rom. encampment. There are building-stone quarries near by. About 2 m. away is the battlefield of Towton. Pop. 6000.

**Taddeo di Bartolo**, see BARTOLI, TADDEO.

**Tadema**, see ALMA-TADEMA.

**Tadmor**, see PALMYRA.

**Tadoussac**, see SAGUENAY.

**Tadpole**, see FROGS.

• **Tadzhiik S.S.R.**, see TAJIKISTAN.

**Taeju**, or **Taekyu**, one of the prin. tns of S. Korea, about 65 m. N.W. of Pusan. Pop. 111,000.

**Tael**, old E. Asian, particularly Chinese, silver unit of weight, still used in sev. places, equivalent to 1.28 to 2.13 oz.

**Tænia**, see TAPEWORM.

**Tænia**, name given in architecture to the projecting fillet on top of the architrave (*q.v.*). The T. of a Doric entablature is plain, but in the Ionic, Corinthian, and Composite orders it is decorated in various styles of moulding.

**Tae-Pings**, followers of Hsün Hsün-Chwan, who rose against the Manchu emperor in 1851. By 1853 the rebels occupied all S. China, and their leader proclaimed himself emperor in Nanking. In 1858 the war with France and England came to an end, and the two powers assisted in the suppression of the rebels, owing to the threat to Shanghai.

**Tafelberg**, see TABLE MOUNTAIN.

**Taffeta**, or **Taffety** (Persian *Atfa*) plain woven silk fabric, introduced into England about the fourteenth century.

**Taflet**, or **Taflelt**, oasis on the E. of the Atlas Mts., Morocco, noted for its dates and leather. It contains some 300 vils., and is a caravan centre. It is the home of the reigning Moroccan dynasty. Bou Am is the chief place. Pop. 150,000.

**Taff Vale Judgment**, see under TRADE UNIONS.

**Taft**, William Howard (1857-1930), Amer. president and chief justice, born in Cincinnati, Ohio. He graduated from Yale Univ. in 1878, and from Cincinnati Law School in 1880. In 1887 he was a

judge of the supreme court of Ohio, and in 1890 was appointed solicitor-general of the U.S.A. He estab. a great reputation as judge of appeal (1892-1900). In 1900 President McKinley made him president of the Philippines Commission, and in 1904 appointed him governor-general, and T. did much to pacify the is. As war minister (1904-8) he furthered the building of the Panama Canal. He was elected president by a large majority, taking up office in 1909. T. improved the financial position of the country, and sought peace agreements with sev. foreign powers. Though nominated by Theodore Roosevelt T. did not, however, carry on his predecessor's policy to the satisfaction of its originator, and the 1910 tariff Acts were particularly unpopular. Roosevelt accused T. of suffering the party to slip back again into the pockets of the trusts, and in 1912 stood once more as presidential candidate. Largely by the hostility to Roosevelt of the bosses and trusts T. was chosen, but the resultant split in the party permitted the return of the Democratic Woodrow Wilson. T. then became a law prof. at Yale, and from 1921 to 1930 was chief justice. His pub. works include *Popular Government* (1913); *The Anti-Trust Act and the Supreme Court* (1914), and *The Presidency* (1916). See lives by H. C. Pringle, 1929; H. S. Duffy, 1930; E. H. Cotton, 1930; and F. C. Hicks, 1946.

**Taganrog**, seaport in the Rostov Region of the R.S.F.S.R., on a bay of the sea of Azov, 50 m. W. of Rostov, on the railway to Stalino. Its importance as a port has declined. Since the revolution it has become a metallurgical centre, while other industries are iron mining and machine building, the iron and steel works, etc., deriving valuable oolitic res from the Kerch Peninsula. T. was taken by the Gers. in 1941, but was soon threatened by the Russians in their return offensive in the Donetz bend in Feb. 1943, and was retaken on Aug. 30. Pop. 188,900. See further under EASTERN FRONT or RUSSO-GERMAN CAMPAIGN IN SECOND WORLD WAR.

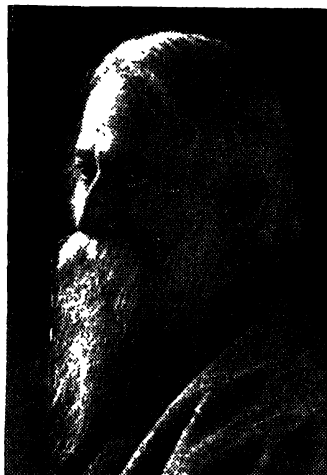
**Tagetes**, see MARIGOLD.

**Tagliamento**, riv. in Venetia, N.E. Italy, rises in the Carnic Alps and flows S. for 100 m. to the gulf of Venice. It was the scene of heavy fighting in the First World War after the It. defeat at Caporetto.

**Taglioni, Maria** (1804-84), It. ballet dancer, b. at Stockholm, where her father, Philippe T. (1777-1871), was *maître de ballet*. She was trained by her father, and he composed the ballet, *La Reception d'une jeune nymphe à la cour de Terpsichore*, in which she made her début in Vienna (1822). She was at once acclaimed the greatest ballerina of the age, and she enhanced her reputation still further when she danced in Paris for the first time in 1827. A visit to St. Petersburg from 1837 to 1842 was also highly successful and influenced the future development of the Russian ballet. Technically she elevated the ballerina to the premier role, and was the first to dance *sur les pointes*. In 1832 she was married to Comte Gilbert

de Voisins, but did not retire from the ballet until 1847. Her later years were marred by poverty, and she supported herself as a teacher of deportment in London.

**Tagore**, Sir Rabindranath (1861-1941), Indian poet and author, son of Maharshi Devendranath, b. in Calcutta. In his youth he wrote verse imitative of the old Vaishnava poets of Bengal, and first produced original work when he was eighteen. After his marriage in 1923 he spent seventeen years managing the family estate at Shilaidah, and gaining a great insight into the life and needs of the Bengali villagers, whose legends and customs inspired so much of his writing.



SIR RABINDRANATH TAGOR

Between 1900 and 1901 he established a self-governing, experimental school at Santiniketan, which flourished and expanded in spite of financial difficulties so that twenty years later he was able to found an international univ., Visva Bharati, and realise his belief that men of different races and civilisations should study together in an atmosphere of peace, brotherhood, and joy in life and work. As the result of a visit to England in 1912, a vol. called *Gitanjali* (Song-Offerings) was pub., trans. by T., who had learnt Eng. in India and had previously lived in England as a schoolboy and a law student. He was the first Indian to be awarded the Nobel prize (1913) and accepted a knighthood two years later, which he disowned in 1919 as a protest against an incident in which Brit. troops were ordered to fire on Punjab rioters. He travelled widely, lecturing in most countries in the world; after 1930 he took up painting and exhibited in New York and sev. European cities.

Some thirty-five vols. of T.'s poems,



plays, essays, and short stories have been trans. into Eng., many by the author, who also wrote a large number of works in his native Bengali, in which he used the spoken dialect, thus giving it a new status in literature. He set over three hundred of his poems to music. His poem, *Lord of the Heart of the People*, was chosen in 1950 (with music by Herbert Murrill) as the national anthem of the republic. T. brought new life to Indian literary art by turning for inspiration to Bengali folklore and everyday life. He always actively supported the Indian national movement, especially through social reforms, and believed that India's task was to show the world the way to peace by setting an example of brotherly co-operation between her various races and creeds. The core of his philosophy was an intense faith in the power of love as the key to man's fulfillment and freedom. His works include *Gitanjali* (1913); *The Gardener* (1913); *Chitra* (1914); *The Post Office* (1914); *My Reminiscences* (1917); *The Home and the World* (1919); *Gora* (1921); *Red Oleanders* (1925); and *Collected Poems and Plays* (1936). See lives by E. Rhys, 1915; R. Sastri, 1917; M. Sykes, 1943; and E. Thompson, 1926, 1949.

**Tagus**, chief riv. of the Iberian Peninsula, rises in the Sierra Albarracín, in 40° 38' N. and 1° 35' W. It flows W.S.W. in Spain through New Castile and Estremadura, and then takes a more southerly course through Portugal. Above Lisbon it widens out from 3 to 8 m., and empties its waters by two arms into the bay of Lisbon. The chief tribs. are the Alberche, Tietar, Jarama, Alagón, and Zizere, all on the r. b., and the chief tribs. on its banks are Toledo in Spain and Lisbon in Portugal. It is navigable to Santarém, but the rapids impede its utility. Length 566 m.

**Tahiti**, or **Otaheite**, largest of the Society Is. (q.v.), a Fr. possession of the E. Pacific. It is a picturesque is. of volcanic origin, composed of two almost regular mountainous areas joined by a low and narrow isthmus; the area to the N.W. is the larger and more lofty, rising to a height of 7688 ft., whereas the S.E. area, Tairapu Peninsula, is nowhere more than 4119 ft. A narrow but very fertile coastal plain surrounds the mountainous interior. The climate is, for the tropics, very healthy; there is an abundant rainfall, and the is. is rich in vegetation, though not greatly cultivated. The chief agric. products are coffee, sugar-cane, coconuts, bread-fruit, yams, bananas, oranges, vanilla, and other tropical fruits. The preparation of copra, sugar, and rum are the chief industries, and copra, vanilla, coconuts, phosphates, and mother-of-pearl form the chief exports. The export trade in 1947 was valued at 131,600,000 francs, the import trade at 368,900,000 francs. The cap. is Papeete, on the N.W. coast, and here resides the governor of the Fr. South Sea possessions, who is assisted by a director and a privy council. The inhab. of T. are a Polynesian race of tall stature, well formed, and frequently of considerable beauty. T. was discovered in 1606 by Quiros. Capt. Wallis, R.N.,

commanding the *Dolphin*, who landed in the group of is. in 1767, named the largest King George III. Is. The following year Bougainville (q.v.), evidently unaware of Wallis's visit, took possession of T. in the name of the Fr. king. A scientific expedition in the *Endeavour* under Capt. (then Lt.) James Cook was sent to T. in 1769 by the Royal Society of London. Cook named the is. the Society Is., and explored T. again in 1777. In 1787 a staff of missionaries of the London Missionary Society was estab. in T. as a centre for the work of evangelisation throughout E. Polynesia. In 1788 T. was visited by the mutineers of the *Bounty* (see BOUNTY, MUTINY OF THE), and in 1791 by Vancouver (q.v.). Following the expulsion by the pop. in 1838 of a Rom. Catholic mission, and the Fr. arrest of Pritchard, the Brit. consul, trouble arose between France and England, in the course of which Louis Philippe lost much popular approval in France. The reigning queen, Pomare IV., died in 1872 after a troubled reign of fifty years. Her son, fifth of the Pomare line, was forced to cede his kingdom to France in 1880. The is. supported the Free Fr. movement in the Second World War. Area 600 sq. m. Pop. 8600. See G. Robertson, *The Discovery of Tahiti: a Journal of the Voyage of the 'Dolphin,' 1766-68* (ed. by H. Carrington, 1949); G. Calderon, *Tahiti*, 1921; H. MacQuarrie, *Tahiti Days*, 1921; R. Keable, *Tahiti, Isle of Dreams*, 1925; P. I. Nardmann, *Tahiti*, 1938; F. Keesing, *The South Seas in the Modern World*, 1942; and Sir H. Luke, *Brian and the South Seas*, 1945.

**Tahlequah**, see under CHEROKEES.

**Taiaha**, Maori weapon, see under MAORIS.

**Taichu**, or **Taiwan**, tin. in the W. of Formosa. Pop. 182,000.

**Taiga**, sub-arctic coniferous forest region, lying S. of the tundra. Spruce, fir, pine, and larch are the chief trees. The T. exists in N. America, Europe, and Asia, and forms about one-third of the area of the U.S.S.R., and there are also fur-bearing animals.

**Taihoku**, or **Taipei**, chief tin. of Formosa, situated in the N. on the R. Tamsui. Tea, rice, and jute are grown. Pop. 230,000.

**Taijutsu**, see JU-JITSU.

**Tail**, formation of hills, see CRAG AND TAIL.

**Taille**, in anct. Fr. jurisprudence a tax, tallage, or subsidy; any imposition levied by the king or any other lord on his subjects. The term was particularly applied to the tax levied by the former in the *poqs d'élection*.

**Tailoring**, cutting and making of clothes. The modern designer-cutter in the bespoke T. business measures, cuts and fits the customer; the tailor and his assistants make up the garment. Tailored garments such as coats are specially treated. Inter-linings of canvas, wadding, holland, etc., are inserted, pad-stitched into position, and tapes fixed at crease-points, over which linings are sewn. This is done to preserve the shape and fit of the garment.

Until the nineteenth century tailored garments were always made to individual measurements, with the exception of certain stocks of standard sizes kept by tailors at large seaports for seafarers who could not wait for the finishing of bespoke garments. During the Industrial Revolution a steady demand for ready-made clothing began, but ranges were limited and garments rather shapeless, and were therefore only worn by those who could not afford bespoke garments. Since 1900 the demand has greatly increased among all income groups, and most clothing is now mass-produced, but of a better cut and fit than the ready-made garments of the past. See M. E. Popkin, *Organisation, Management, and Technology in the Manufacture of Men's Clothing*, 1929; H. Simons, *Science of Human Proportions*, 1933; M. E. D. Galbraith, *Ladies' Tailoring Simplified*, 1937; W. H. Hulme, *The Theory of Garment-Pattern Making*, 1945, and *Women and Children's Garment Design*, 1948; and J. K. Wilson, *The Art of Cutting and Fitting*, 1948.

**Tailteann Games**, Irish national games. They were popular if informal events in the Middle Ages, when they were held in many places. They were revived in 1924, and held again in Dublin in 1928. They include competitions, not only in athletic events, but in poetry, drama, and prose, and also in art, music, and dancing.

**Tain**, royal burgh of Scotland, in the co. of Ross and Cromarty, on Dornoch Firth, 25½ m. N.E. of Dingwall. 3½ m. S.E. of the tn. are the remains of the Early Eng. abbey of Fearn, founded in 1230. T. has a collegiate church, founded in 1471 and restored in 1871-76. T. is a mkt. tn., and the industries are distilling and aerated waters. Pop. 1300.

**Taine, Hippolyte Adolphe** (1828-93), Fr. historian and critic, born at Vouziers, and educated at the Collège Bourbon and École Normale. After serving in the provs. under the Ministry of Public Education, he returned to Paris (1852) and won his literary degree (1853) with a critique on La Fontaine. The following year his essay on Livy gained the academy prize, and he decided on literature as a profession. In 1865 he began a series of articles on Eng. literature, pub. in 1864. In 1858 appeared a first collection of *Essais de critique et d'histoire*. The originality of his critical theories, as first expressed in the preface to his *Histoire de la littérature anglaise* (1863) lies in the application of the scientific and naturalistic method to literature. The defect in his principles is that he makes too little allowance for the individual's deviation from type and tends to regard literary genius too much as the mechanical outcome of known and defined productive forces. T. became prof. of aesthetics and the hist. of art at the École des Beaux Arts in 1864, a post he held for twenty years. *L'Intelligence* (1870) was a return to philosophy. The last twenty years of his life were mostly devoted to the series on *Les Origines de la France contemporaine* (1876-93). He became a member of the Fr. Academy in 1878. T. was a follower of Hegel, and, more indirectly, of

Spinoza. His determinist and materialist outlook had a great influence upon contemporaries, though it was later challenged by Croce, as in the latter's *History as the Story of Liberty* (1941). See study by M. Leroy, 1933; and V. Giraud, *Essai sur Taine*, 1901; A. Chevrillon, *Taine: formation de sa pensée*, 1932; and K. de Schaedryver, *Taine: essai sur l'unité de sa pensée*, 1938.

**Tairen**, see **DAIREN**.

**Tait, Archibald Campbell** (1811-82), archbishop of Canterbury, b. in Edinburgh. He was educated at Glasgow Univ. and Balliol College, Oxford. In 1842 he succeeded Dr. Arnold as headmaster of Rugby; in 1849 he became dean of Carlisle. In 1856 he was made bishop of London, and twelve years later was raised to the primacy.

**Tait, Peter Guthrie** (1831-1901), Scottish mathematician and physicist, born at Dalkeith, and educated at Edinburgh Academy, Edinburgh Univ., and Peterhouse, Cambridge. He became senior wrangler and first Smith's prizeman in 1852. In 1854 he was appointed to the professorship of mathematics in Queen's College, Belfast, and removed to Edinburgh in 1860 to occupy the chair of natural philosophy. In mathematics he is well known for his development of the theory of quaternions. His physical researches and experiments were mainly in connection with thermo-dynamics and thermo-electricity. He collaborated with Prof. Thomson (Lord Kelvin) in the production of their *Treatise on Natural Philosophy* (1867), with Balfour Stewart in writing *The Unseen Universe, or Physical Speculation on a Future State* (1875), and *Paradoxical Philosophy* (1878) and with W. J. Steele in *A Treatise on the Dynamics of a Particle* (1856). Besides numerous mathematical and physical papers he pub. treatises on *Heat, Light, Properties of Matter, Dynamics, and Quaternions*. His scientific papers were pub., with a life by C. G. Knott (1898-1911).

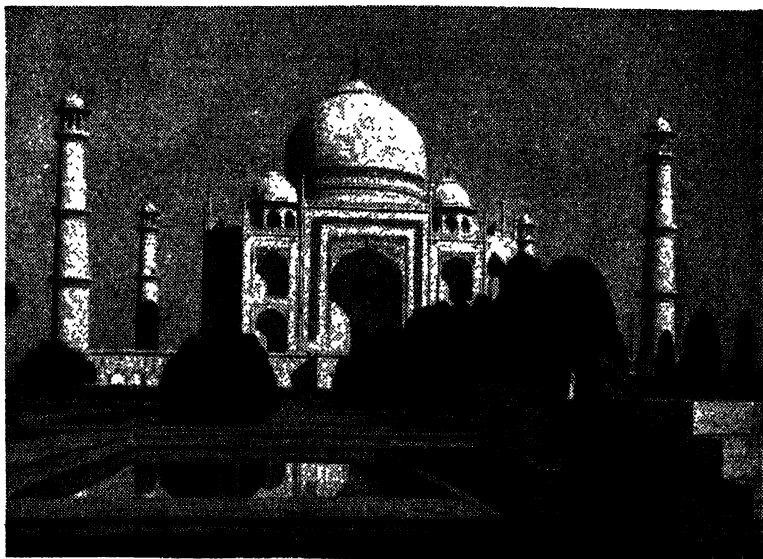
**Taiwan**, see **FORMOSA**.

**Tajik**, or **Parsiwan**, Persian-speaking race of Afghanistan, representing the serving class of that country and of the country N. of the Oxus. The Ts. ('strangers') are an athletic race, fine fighters, and skilled farmers. They have assimilated the manners and customs of the Afghans, but are not nomadic. Ts. form 0.6 per cent of the pop. of Soviet Russia.

**Tajikistan**, republic of the U.S.S.R., on the frontier between Russia, Afghanistan, and W. China at the junction of the Pamir and Tianshan Mts. The country became an autonomous republic in 1924, and a union republic in 1929. Three-quarters of the pop. are Tajik (q.v.), and the remainder are Uzbeks, in the N.W. Kirghiz, and Russians. Administratively the republic comprises the Garm, Kulyab, Leninabad, and Stalinabad Regions; on the slopes of the Pamirs lies the Gorno-Badakhshan autonomous region (cap. Khorog), affiliated to the republic and inhabited by Kirghiz and Tajik. The country has the appearance of vast terraces, formed of

deep valleys, semi-desert steppe, high table-land, and mts. The Tianshan Mts. contain Mt. Stalin (24,590 ft.), Mt. Lenin, and the Fedchenko Glacier, 50 m. in length. The mt. glaciers are the source of many rapid rivs., tribs. of the Amu-Darya, which flows from E. to W. as the S. frontier of T., one of the largest being the Vakhsh. Large irrigation systems have been built in the valleys of W. T. and the nearby mts., the total irrigated area being 725,000 ac. in 1938. Extensive rice and cotton plantations are estab. in the irrigated valleys and foothills. Cotton

education has progressed, and by 1939 72 per cent of the pop. were literate. There are some seventy newspapers in the Tajik, Uzbek, and Kirghiz languages. The pop., which increased by 44 per cent between the 1917 and 1939 censuses, numbers 1,485,000. The area is 55,000 sq. m. Stalinabad (pop. 83,000) is the cap. See also CENTRAL ASIA. See V. M. Bardie, *Tadzhikistan*, 1940, and R. A. Davies and A. J. Steiger, *Soviet Asia*, 1943. **Taj Mahal**, mausoleum at Agra, India, built by Shah Jehan about 1629-50 as a tomb for his favourite wife. Mumtaz



THE TAJ MAHAL, AGRA

E.N.A.

has long been grown in the N.W., and long-fibre Egyptian cotton has been introduced in the midlands and S. of Tianshan, and the area is the chief centre for the product in the Soviet Union. Apricots, grapes, apples, pomegranates, almonds, walnuts, and pistachios are grown, and sugar in the extreme S. On the non-irrigated areas barley and wheat are grown, and cereals and grapes are produced on the Pamir table-lands. Horses, cattle, goats, and sheep are reared in the mt. pastures. Mineral production has been developed, coal, oil, gold, non-ferrous metals, and rare elements being found. Industrial output includes cotton and silk goods, leather goods, footwear, cotton-seed oil, and canned meat, vegetables, and fruit. Hydro-electric power is used at Stalinabad and Leninabad. Motor roads have been developed, and Stalinabad is linked by rail to Tirmez. As in the other central Asian republics,

Mahal. He too lies buried there. The building is mainly of white marble, with a centre dome and four smaller domes at the corners, and four minarets. A marble terrace surrounds it. The mausoleum was constructed in the Persian style by Ustad Isa, a Turkish architect.

**Takahe**, or **Notornis**, flightless bird of New Zealand. A species of moorhen belonging to the Ralliformes, it weighs 5 lb. and is about 18 in. in height. The tail and back are bronze-green in colour, the head and breast bluish-black, and the bill red and short. Its fossil remains were found in the 1840s, and the T. was thought to be extinct, but living specimens were later caught, and specimens were observed and photographed in 1948.

**Takelma Language**, see under NORTH AMERICAN NATIVE LANGUAGES, *Pacific Areas*.

**Takla-makan Desert**, desert of E. Turkestan, forming part of the Gobi

**Desert.** It is bounded on the E. by Lob Nor. on the W. and N. by the Yarkand Daria (R. Tarim), and on the S. by the Kuenlun Mts. It extends E. and W. for 600 m., and from N. to S. for about 200 m. It is traversed by the R. Khotan, whose course Carey, in 1885, followed to its junction with the Tarim. Sven Hedin explored the buried tn. of T. in 1896, and Sir Aurel Stein crossed the desert in 1907-8.

**Takoradi**, port of the Gold Coast, Africa, opened in 1928. It is the only complete shelter, between Nigeria and Sierra Leone, for ships of over 30-ft. draught. The main line of the Gold Coast runs from T. to Kumasi, thence to Accra. It is a wireless station. The chief exports are gold, manganese ore, cocoa, palm oil and kernels, kola, hides, and mahogany. T. was an allied supply base for the Middle E. during the Second World War, when the Mediterranean route was closed.

**Talavera de la Reina**, tn. of Spain, in the prov. of Toledo, on the Tagus, 75 m. S.W. of Madrid, in a fertile wine-growing dist. It possesses very fine squares and streets, with Rom., Moorish, and Gothic remains, and has manufs. of silk and earthenware. Wellington here defeated a Fr. force under Joseph Bonaparte, Jourdan, and Victor on July 27 and 28, 1809. Pop. 14,500.

**Talbot, John and Charles**, see SHREWSBURY, EARLS OF.

**Talbot, Richard**, see TYRCONNEL, EARL OF.

**Talbot, William Henry Fox** (1800-77). Eng. inventor, b. at Laycock Abbey, Wiltshire, educated at Harrow and Trinity College, Cambridge. He worked chiefly in mathematics and optics, and chemical changes of colour. He discovered the calotype process on which modern photography is built, for which he received the medal of the Royal Society, 1842. T. was also a botanist, chemist, and philologist, and one of the first translators of the Assyrian cuneiform inscriptions. He wrote *Pencil of Nature* (1844) on his photographic discoveries.

**Talc**, hydrous bi-silicate of magnesia, which crystallises in the rhombic system (hardness 1, sp. gr. 2.8). Crystals are rare and the massive form 'steatite' or 'soap-stone' is more common. Fr. chalk, pot-stone, and figure-stone are all varieties of T. It is used as a filter for paints and paper, a toilet powder, for insulation and acid resistance, in soap as a lubricant, and for making ornaments.

**Talca**: 1. Prov. of central Chile, with Curicó to the N. and Maule and Linares to the S. Wheat, wine, and cattle are produced. Area 3721 sq. n. Pop. 157,100. 2. Cap. of the above, 150 m. S. of Santiago. An important trade centre on the Claro and Piduco Rs. It is a railway junction. The prin. industry is the manuf. of woollen 'ponchos.' Shoes, biscuits, paper, tobacco, and flour are also made, and there are foundries and distilleries. Pop. 57,000.

**Talcahuano**, see CONCEPCION.

**Taldy-Kurgan**, region of the Kazakh S.S.R., E. of Lake Balkhash, beyond the Alma-Ata Region, bordering on Sinkiang.

The region is traversed from N.E. to S.W. by the railway from Semipalatinsk to Alma-Ata. The cap. is Taldy-Kurgan.

**Talegallus**, see BRUSH TURKEY.

**Talent** (Lat. *talentum*, Gk. *τάλαντον*, from *τα* or *ταλ*, to lift, to bear), unit of weight in use among the anc. Gks. It was probably based on the Babylonian unit (called *qin* in Sumerian and *biltu* in Accadian). According to Herodotus, the T. was divided into 70 Euboic mines. The Attic T. weighed 26.20 kg., and was divided into 60 *minæ* (of 436.6 gr.) or 6000 *drachmæ*. The Egyptian *kerker* (of 300 *kite*) of the Ptolemaic age corresponded to the Gk. T., but in later times various Ts. were current in Egypt. The Heb. *kikkar* of the Hellenistic period corresponded to 10,000 Attic *drachmæ* = 125 Rom. lb. = 43.6 kg., but the weight of the pre-Hellenistic *kikkar* is uncertain. As gold and silver were not coined before the seventh century B.C., the use of the balance for weighing out precious metals led to the employment of the unit of weight as a unit of value. Hence the term T. persisted as applied to money throughout the E. Mediterranean dists. Its use to denote intellectual gift is derived from the parable of the Ts. (Matt. xxv.)

**Talien-Wan**, see DAIREN.

**Talisman**, object with magical powers, often worn on the body, and credited with more positive effects than the amulet (q.v.).

**Talking Machines** include the gramophone (q.v.) and the 'Dictaphone', which records speech on a wax cylinder for subsequent reproduction (e.g. dictation of letters for a typist). Some models employ electrical recording, and various types are adapted to record telephone conversations, etc.

**Talking Pictures**, see CINEMATOGRAPH.

**Tallage**, tax of the Anglo-Norman and Plantagenet periods, imposed on the royal tns., bors., and demesne lands. By the statute *de tallagio non concedendo*, 1297 (an unconfirmed draft of the *Confirmatio Cartarum*, which latter document makes no mention of T.), it was provided that no T. should be taken without the consent of the Commons. Notwithstanding the strict legality of imposition, the levy was resisted until Parliament abolished the tax in 1340.

**Tallahassee**, city, co. seat of Leon co., and cap. of Florida, U.S.A., 26 m. N. of the gulf of Mexico; it has cotton factories. There is a state college for women (founded 1906) and a college for Negroes. Pop. 19,000.

**Tallasi**, see TULSA.

**Talleyrand-Périgord, Charles Maurice de** (1754-1838), Fr. statesman, born in Paris. The effects of a fall when about a year old rendered him lame for life, and he was early destined for the Church. He was sent to the Collège d'Harcourt, and thence to the seminary of St. Sulpice and to the Sorbonne. In 1780 he was appointed general agent of the clergy of France. In 1788 he was appointed bishop of Autun, became a member of the States-General convoked in 1789, and having accepted the civil constitution of the clergy, was ex-

communicated in 1791. In 1792 he went on a mission to England, and in 1794 was banned from France for supposed dealings with Louis XVI. He spent two years in England and America, returning to Paris in 1796. T. was appointed foreign minister by the Directory in 1797. He supported the foreign and domestic policy of Napoleon until he grew convinced that this policy could only lead to disaster for France, and at Erfurt and afterwards worked against the emperor and for the restoration of the Bourbons in the name of 'legitimacy.' He became foreign minister to Louis XVIII. in 1814.

At the Congress of Vienna T. played a leading part, obtaining favourable terms for France, and securing her readmission to the concert of European powers, by playing off the victorious allies against each other. He supported Louis Philippe in 1830, and until 1834 was envoy in London, where he played an important part in the estab. of a neutral Belgium, and concluded the Quadruple Alliance of 1830 with England, Spain, and Portugal. A man of considerable ability and intellect, his services to France under a succession of rulers were very great. His *Mémoires* were ed. by the Duc de Broglie (1892, Eng. ed. trans., 1892). See lives by A. Duff Cooper, 1932, 1949, and L. Madelin, 1948.

**Tallinn**, formerly **Reval**, cap. of the Estonian S.S.R., a fortified seaport on the S. coast of the gulf of Finland, 249 in. W.S.W. of Leningrad. The port is kept open by ice-breakers through the greater part of the winter months. T. consists of two tns., the upper and lower, the latter containing many remains of medieval times. The prin. buildings are the fifteenth-century cathedral, the tn. hall, guild house, and castle, and the churches of St. Nicholas, Holy Ghost, and St. Olaf, the last-named having one of the loftiest spires in the world. In 1936 the former technical faculty at the univ. of Tartu (Dorpat) was made an independent technical univ., situated in T. The numerous industries include textiles, paper, cellulose, machinery, and leather, and timber, flax and linen goods, and agric. produce are exported. T. has an excellent harbour, and is one of the chief ports of the Baltic. It was founded in 1219 as a Dan. tn. in 1284 became a Hanseatic tn., and later was a stronghold of the Livonian knights. It became Swedish in 1561, and was annexed to Russia in 1710. T. was developed after the estab. of Estonia. Pop. 145,000.

**Tallis**, Thomas (c. 1515-85), Eng. church-music composer, b. probably in Leicestershire, was organist at Waltham Abbey until 1540, and for the next twenty-seven years gentleman of the Chapel Royal, besides being with his pupil, Byrd, joint-organist there. In 1575 they were granted the monopoly of music-publishing for twenty-one years. The second Prayer Book of Edward VI., issued in 1552, created the demand for new church music, which T. was one of the chief to supply, a notable work being the service in the Dorian mode, pub. in 1641.

**Tallow**, composed chiefly of the triglycerides of palmitic, stearic, and oleic acid, is derived mainly from beef and mutton suet, the fat therefrom being 'rendered' or separated by steaming under pressure in steel cylinders. The top layer is drawn off and allowed to solidify. The quality depends on skill in rendering and the part of the animal used. Best quality T. is edible; other grades are used largely for soap manuf., candles, and lubricants.

**Tallow Tree** (*Elaeagnus sebiferus*), Chinese tree of the family Euphorbiaceae which bears yellow flowers followed by small fruits, the seeds of which yield a wax used for making candles. The wood of the tree is very hard and is used in printing. Another tree (*Pentadesma butyracea*), of the family Guttiferae, bears large red flowers followed by edible berries. A thick, yellow, greasy juice exudes from the tree when cut.

**Tally** (Fr. *tallier*, to cut), stick or rod of well-seasoned hazel, willow, box, or other suitable wood, squared with a knife, and marked on one side with transverse notches of different size, indicating, for example, £, s., and d. The notched stick, a primitive mnemonic device or memory aid for recording numbers, was employed by some primitive peoples of Australia, N. America, W. Africa, and Asia, as an aid in conveying messages (see under WRITING). It was used also in anct. Scandinavia, England, Italy, Russia, and other countries, but mainly to express numbers. In England exchequer T's, for recording payments between the Crown or gov. were introduced shortly after the Norman conquest; they had the advantage of providing a perfect check for both parties, and of being understood by illiterate people. The amount of the transaction (loan to the sovereign, or tax, 'tallage,' etc.) was cut (*taillé*) by the 'tallator,' who also split the T. into two unequal parts; the chamberlain retained the smaller part (leaf, foil, or T.), the larger part (stalk, counterfoil, or counter tally) being held by the other party. T's. were used officially (notwithstanding Burke's Act for their abolition, 1782) until the death of the last chamberlain of the exchequer in 1826. The verb 'to tally,' i.e. to agree, derives from the T.

**Talma**, François Joseph (1763-1826), Fr. actor, b. in Paris, introduced naturalism into acting, and made Shakespeare known in France. His memoirs were ed. by A. Dumas (1849-50).

**Talmud**, The ('Study'; an abbreviation of *Talmud Torah*, 'Study of the Torah'), collection of Jewish books, containing traditions, laws, rules, and institutions, by which, in addition to the Heb. Bible, the conduct of Jewry is regulated. The fall of Jerusalem, the destruction of the temple, the dissolution of the Jewish state, and the dispersion of its inhab. (see under JEWS) did not annihilate Judaism. To avert extinction the great rabbis planned that the *Torah* of Moses ('the Pentateuch') was to become the dominating factor in Judaism, its supreme authority, the guide of its actions, the source of its knowledge of the divine will,

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The T. is the product of Rabbinic Judaism, and unlike the Heb. Bible, which is the Holy Scripture not only of the Jews but also of the Christians and Muslims. In the main, and with very few exceptions, it has only been studied by Jews, who have always valued it highly. Taken as a whole it presents the appearance of a disorderly mass of the most heterogeneous material, relating to religion, ethics, hist., legend, folklore, astronomy, mathematics, law, physical life, botany, etc. The material of the T. may be divided into two main categories, the *halachah* and the *haggadah* ('narration'). The latter word, originally applied to all the results of the interpretation of scripture, later (when the *halachah* was recognised and studied as a special dept.) denoted the non-*halachic* sections of the T., i.e. the interpretation of the *Torah* for edification and not directly for the regulation of conduct. The *haggadic* teaching in the anct. academies and in the medieval synagogues created a new branch of Rabbinic literature known as *nidhrashim* (from the root *darash*, 'to seek, deduce, interpret'), the system of 'interpretation' of scripture employed by Rabbinic Judaism. The T. has moulded the Jewish nation, influencing their opinion, stimulating their spiritual and religious life, promoting their intellectual activity, and regulating their conduct: in short, it helped to preserve the existence of Jewry.

The Babylonian T. was first pub. by Daniel Bomberg in Venice (1520-23) in twelve folio vols., and has been frequently reprinted. The Palestinian (Jerusalem) T. was first pub. by Daniel Bomberg (c. 1523-24) in one folio vol., then reprinted at Cracow (1609), at Krotoshin (1866), at Piłkówek (1898-1902), and at Wilno (1922). The first unabridged and authori-

tative Eng. version, in thirty-four vols., was completed and pub. in 1949 (editor, Dr. I. Epstein). An excellent comprehensive selection of the T. has been made by Dr. A. Cohen (*Everyman's Talmud*, 1932, 1949). An admirable Eng. version of the *Mishnah* has been pub. by the Canon Dr. H. Danby, Regius prof. of Hebrew at Oxford (1933).

**Talpa Europaea**, see MOLE.

**Tamar**, riv. of England, the boundary between the cos. of Devon and Cornwall, forms the estuary of the Hamoaze at Devonport and flows into Plymouth Sound. It is navigable to Launceston. Length 60 m.

**Tamarind** (*Tamarindus indica*), leguminous evergreen tree cultivated in India and other tropical countries for its hard, close-grained, heavy wood. It bears pinnate leaves and racemes of yellow, red-streaked flowers followed by legumes, the pulp of which is preserved in syrup; it is a gentle laxative.

**Tamarisk** (*Tamarix*), genus of shrubs, a native of India, W. Asia, and S.W. Europe. The common T. (*T. gallica*) has become naturalised on the S. and E. coasts of Britain, where it has been extensively planted to bind and cover sand-dunes. It is evergreen, and the bright green, minute, scale-like leaves and spikes of rose-pink blossoms are borne on drooping reddish or purple branches. *T. pentandra* (or *T. hispida australis*) flowers in Aug. and Sept., *T. anglica* in late summer and thrive by the sea. *T. mannifera* exudes manna.

**Tamatave**, port of Madagascar, faces the Indian Ocean, 140 m. N.E. of Antananarivo. Coral reefs nearly encircle the harbour. The tn. is connected with Antananarivo by railway. Pop. 24,900.

**Tamate**, see under MELANESIA.

**Tamaulipas**, maritime state of Mexico, with Texas to the N. Inland the surface is mountainous, dipping towards its lagoon-fringed shore on the gulf of Mexico. There are large cattle ranches, and cattle and their products are exported, as well as cotton, rice, and sugar-cane. Oil is produced in the S. Cap. Ciudad Victoria. Area 30,731 sq. m. Pop. 458,900.

**Tambour**, see EMBROIDERY.

**Tambourine**, percussion instrument consisting of a vellum head over a circular wooden frame in which 'jingles', i.e. small cymbals loosely working on a centre-pin are inserted. It is played by rapping or rubbing with the hand, or by shaking.

**Tambov**: 1. Region of the R.S.F.S.R., bounded on the N. and W. by Ryazan, on the E. by Penza and Saratov, and on the S. by Voronezh. It is a fertile black-earth region of wide valleys and plains, cut by deep ravines, while there is much forest-land in the W. The rvs. are the Moksha and the Tsna, tribs. of the Oka, and the Voronezh and Khoper, tribs. of the Don. Coal, iron, phosphorus, limestone, gypsum, and clay are found. The crops are wheat, millet, oats, rye, barley, potatoes, etc.; hemp and flax, tobacco and beetroot, are grown. The chief tns. are T. (cap.), Michurinsk, and Kirsanov. Area 12,467 sq. m. Pop. 1,882,000. 2. Cap. of the above, on the Tsna, a railway junction,

300 m. S.E. of Moscow. There are metal industries, mills, breweries, and manufs. of synthetic rubber. The tn. trades in agric. produce. Pop. 121,200.

**Tamburlane**, or **Tamerlane**, see TIMÛR BEG.

**Tamil**, Dravidian language, spoken by over 18,000,000 people in the S.E. portion of S. India (i.e. the great plain of the Carnatic, from Madras to Cape Comorin, and S. Travancore), and in N. Ceylon. Malayalam is closely akin to T., while Kanarese is more akin to Telugu (q.v.) than to T. T. is the oldest, richest, and most thoroughly organised of the Dravidian languages. The earliest records of T. date from the eighth century A.D. On the Ts. in Ceylon see under CEYLON.

**Tammany Hall and Society**. New York party organisation estab. in 1789 as the Columbian Society, soon after Washington's installation as president, by an Irish-Amer., Wm. Mooney, for social and charitable purposes. In 1805 it adopted the title of Tammany Society (apparently from the name of an Indian chief, Tammamena). With the rapid increase of its membership, twenty-five years after its foundation it espoused politics, and allied itself with the Democratic party of New York, and from 1834 estab. its nominees in the New York mayoral office in the majority of cases. T. H. rapidly became an instrument of corruption in public life, and suffered a severe blow in 1871 when its leaders were brought to trial. Its later hist. is associated mainly with the names of Richard Croker, one-time keeper of a liquor saloon, and Charles F. Murphy. Croker held no civic office, but as chairman of the Tammany sub-committee controlled all the city officials, and indeed inspired all the city legislative proposals at Albany.

Its organisation is held together by about 1000 voting dists., each under a 'captain' nominated by the Tammany committee, who nurses the voters, while the committee members of the society are annually elected by the different 'assembly districts' in the city bors. In more recent years it has been claimed that Tammany is a great reformed organisation, but state committees and similar bodies in 1890, 1894, 1899, and 1931 criticised it severely. See S. J. Tilden, *The New York City 'Ring'*, 1873; J. Bryce, *American Commonwealth*, 1888, 1910; and M. R. Werner, *Tammany Hall*, 1929.

**Tammerfors**, or **Tampere**, tn. of Finland, 102 m. N.W. by N. of Helsinki, on both sides of the Tammerkoski, whose rapids are utilised for industry. It is the chief industrial tn. of Finland, and has manufs. of cotton, linen, paper, footwear, and woollens. Lumbering is also carried on. Pop. 87,100.

**Tammuz**, or **Thammuz**, Babylonian and Assyrian god identified with the GK. Adonis. He represents the decay and growth of natural life, descending part of the year into the nether world, and being rescued from there by his sister, the heaven goddess, Inanni (Inanna), or Ish-tar, the Phenician Astarte (q.v.). Another version of the myth of T. in association

with that of Ishtar is that the latter slew him after he had become her husband, and for his sake she descended into Hades. The fourth month of the Babylonian year was named after him, and the Hebs. used the same title for theirs.

**Tampa**, city of Florida, U.S.A., co. seat of Hillsborough co., 240 m. S.W. by S. of Jacksonville. On T. Bay, it is a popular winter resort. There is a large trade in phosphates and other products, through Port T. (q.v.), 9 m. S.W. Of its many manufs., including engineering goods, furniture, bricks, etc., that of Havana cigars takes first place. Pop. 124,000.

**Tampico**, port of Tamaulipas, Mexico, on the R. Panuco, which runs into the gulf of Mexico, situated some 7 m. from the bar, 206 m. N.N.E. of Mexico city, with which it is linked by rail, road, and air. Surrounded by lagoons, T. lies in the midst of an oil-bearing dist. The chief N. Mexican port, it exports oil, silver, sugar, rubber, asphalt, and maize. Pop. 81,300.

**Tamsui**, fort and treaty port of Formosa, on the N.W. of the is. The port for Taihoku, it trades in rice, tea, sugar, and coal. Pop. 18,600.

**Tamus (Black Bryony)**, genus of perennial climbing plants (family Dioscoraceae) with a large black tuber and a slender twining stem bearing numerous heart-shaped leaves and clusters of small green flowers followed by scarlet berries.

**Tamworth**: 1. Municipal bor. and mrkt. tn. of Staffordshire, England, at the junction of the Tame and Anker R's. Birmingham, 15 m. N.N.E. of T., was once the cap. of Mercia. T. was one of the places where King Athelstan held councils. It has a castle with a Norman tower and keep. The mound was built by Ethelfleda, daughter of Alfred the Great. The par. church was reconstructed in the fourteenth century. Industries include engineering, paper making, and the manuf. of asbestos goods, sanitary ware, clothing, and small wares. In the vicinity are large market gardens and the N. Warwickshire coal-field. Pop. 13,000. 2. City in the N.W. slopes of New S. Wales, Australia, on the R. Peel, 282 m. N. of Sydney, incorporated in 1876 and proclaimed a city in 1946. T. was the first tn. in Australia to use electricity for street lighting, in 1888. It stands in an agric. and sheep-rearing dist., where diamonds and gold are found. Pop. 12,000.

**Tan**, or **Tan Waste**, spent bark from T. pits, used in gardening for making hotbeds and as a material in which pots are plunged, and on riding tracks.

**Tanacetum**, see TANSY.

**Tanager**, name for any bird of the family Tanagridae, allied to the finches. They are natives of Central America, and nearly all of them have very brilliant plumage. One of the finest is the superb genus *Calliste fastuosa*; its plumage has a remarkable metallic lustre; the head is sea-green in colour, the breast is violet, and there is a flame-coloured patch on the lower part of the back. It feeds on fruit and insects, and is sometimes kept in an indoor aviary. *Tanagra rubra*, the scarlet T., or summer

red bird, has brilliant scarlet plumage, with black wings and tail. In autumn its plumage changes to a dull green, like that of the female bird.

**Tanais**, see DON.

**Tananarivo**, see ANTANANARIVO.

**Tancred** (1078-1112), leader of the first crusade, nephew of Bohemond and a grandson of Robert Guiscard. He accompanied his uncle to Constantinople in 1096 and after the capture of Nicea took service with the Emperor Alexis. He took Tarsus, but was evicted by Baldwin of Lorraine. He played a prominent part in the sieges of Antioch and Jerusalem, and became prince of Galilee in 1099. When Baldwin became king of Jerusalem T. took over the regency of Antioch (1100-1103), and later became prince of Edessa and Antioch. He fought chiefly against the rulers of N. Syria.

**Tanda**, tn. of United Provs., India, near the R. Gogra, 86 m. N.W. of Benares. Pop. 19,400.

**Tanderagee**, mrkt. tn. of N. Ireland in co. Armagh, situated on the Cashier, 5 m. S. of Portadown, with manufs. of linen, yarn, and oatmeal. Pop. 1500.

**Tandy, James Napper** (1740-1803), Irish patriot, b. in Dublin, was the first secretary of the Society of United Irishmen. He estab. an armed force on the pattern of the Paris National Guard. He was obliged to take refuge in America, and in 1798 went to Paris, and in conjunction with Wolfe Tone and others planned an invasion of Ireland. They were assisted by the Fr., and landed in Ireland in Sept. 1798. This failed, and T. was sentenced to death, but reprieved. He died in France.

**Tanfield**, part of urb. dist. of Stanley in Durham, England, 12 m. N.W. of Durham, with coal-mines, brick and tile works. Pop. 10,000.

**Tanga**, bay and seaport on the E. coast of Africa, 75 m. N. of Zanzibar. It is the chief port of Tanganyika Ter., with an excellent harbour sheltered by the is. of Pemba, and is the coastal terminus of the N. Railway to Moshi and Arusha (272 m.), and has railway workshops. Pop. 18,000.

**Tanganyika, Lake**, lake of E. Central Africa, situated between 3° and 9° S. lat. It is about 450 m. in length (the longest lake in the world), with an average breadth of from 30 to 45 m., and an area of 12,700 sq. m. With the exception of Lake Baikal, it is the deepest fresh-water lake in the world, soundings of over 4000 ft. having been taken.

**Tanganyika Territory**, area in E. Central Africa, bounded on the N. by Kenya Colony and Protectorate, Lake Victoria, and Uganda; on the W. by Belgian ter., Lake Tanganyika, Rhodesia, Nyasaland, and Lake Nyasa; on the S. by Portuguese Africa; and on the E. by the Indian Ocean, with a coastline of 450 m. Great Britain administers T. T. under United Nations trusteeship, replacing the former League of Nations mandate. The ter. is administered by a governor, aided by a nominated executive council and a legislative council of (since 1945) fifteen official and up to fourteen unofficial



members. T. T. corresponds in part to what, prior to the First World War, was Ger. E. Africa, the rest of which ter., namely the dists. of Ruanda and Urundi in the N.W. and the Kionga area in the S., being entrusted to Belgian and Portuguese administration respectively. T. T. extends from the Umba R. in the N. to the Rovuma in the S. Along the coast lies a plain, varying in width from 10 to 40 m., behind which the country rises gradually to a plateau constituting the greater part of the hinterland. This plateau falls sharply from a general level of 4000 ft. to the level of the lakes—Tanganyika (2500 ft.), Nyasa (1607 ft.), which mark the great Rift valley extending northwards to Lake Naivasha. The area is about 360,000 sq. m., which includes about 20,000 sq. m. of water.

**Physical Features.**—The highest points in the ter. are in the N.E., where are the extinct volcanoes, Kilima Njaro (19,720 ft.) and Mt. Meru (14,960 ft.). In the S.W. are the Livingstone or Kipengere Mts., where the highest peak is over 9000 ft. Portions of the great lakes of Central Africa are included in the ter., viz. the S. portion of Lake Victoria, the E. shores of the lower part of Lake Tanganyika, and the N. and N.E. shores of Lake Nyasa. There are four smaller lakes and numerous rivs. The is. of Zanzibar (an independent protectorate), Pemba, and Mafia lie off the coast.

**Government and Provinces.**—The ter. is divided into eight provs.: Central (cap. Dodoma), native pop. 556,500; Eastern (Dar-es-Salaam), 650,000; Iringa (Mbeya), 544,500; Lake (Mwanza), 1,600,000; Southern (Lindi), 591,000; Northern (Arusha), 408,000; Tanga (Tanga), 382,300; Western (Tabora), 705,000. The form of native administration is a system of local self-government commonly known as 'indirect rule,' under which the tribal units in the various dists. are constituted native authorities by a Native Authority Ordinance. In addition to the general obligation to assist the central gov. in maintaining order and preventing crime, they act as agencies of the gov. in the discharge of a number of its social activities. The native courts form an integral part of the system of local government. They have limited jurisdiction in cases in which both parties are natives, trial being according to native law and custom. The Brit. Gov. is stimulating the natives to take a greater interest in both local and territorial government, by the estab. of representative native institutions. In 1948 the native membership on the Legislative Council was four, and Indian three.

**Climate and Health.**—The rainfall, generally speaking, is low for a tropical country and sometimes there are great droughts. There are three types of climate: the Indian or trade wind type, which prevails over the greater part of the ter., with a rainy season from Dec. to April and its hottest period in Nov.; the monsoon type prevailing in the N.E., with rainy seasons between March and May and in Nov., and its hottest period in Feb.; and the equatorial type prevailing in the N.W., having

two warmer and two cooler seasons, the warmer being in Oct. and Feb.—March, and the cooler in July and Nov.—Dec., and its rainy season in Oct.—May (Nyanza) or Nov.—April (Tanganyika). The average yearly temp. in the coast region is 78° F. Malaria is prevalent, especially during and after the rainy season; but in the tns. public health depts. maintain sanitation at a high level for tropical Africa. Sleeping sickness occurs on the S. and W. boundaries, and relapsing fever is widespread. Yaws, a common native disease, receives mass treatment. Ankylostomiasis (q.v.) and bilharziasis (q.v.) occur in low-lying dists.

**Religion.**—The majority of the inhab. are pagans. Common features among many tribal beliefs are a belief in a supreme being and in the possibility of communion with the spirits of the departed. There is a large African Muslim pop. of the Sunni sect, to be found chiefly in the coastal areas and in the up-country trading settlements. It is estimated that Christian Africans now number 650,000, of whom 433,000 are Rom. Catholic.

**Production, Communications, etc.**—Sisal hemp is the chief product, over 105,000 tons (one-third of the world supply) being exported in 1947. Coffee of excellent quality is grown, especially the Robusta variety, which is grown in the Bukoba dist. and on the slopes of Mt. Kilima Njaro near Arusha and Moshi. Rice is cultivated around Mwanza. Potatoes, European cereals, fruits, and vegetables can be cultivated, and cotton and tea are produced. Timber forests occur from the rain areas of the mt. ranges to the mangrove swamps of the creeks and riv. mouths, and cover 107,000 sq. m. Forestry exports include beeswax, copal, gums, and resins, rubber, mangrove poles and bark, fine woods, ebony, and palm kernels, the most important being beeswax, gums (copal and arabic), and mangrove bark. There is a wealth of mineral deposits, output in order of value being gold, diamonds (the largest mine, at Mwadui, being discovered in 1940), tin ore, salt, mica, silver, building materials, tungsten ore, lead, and kaolin. Eight coal-fields are known, three being probably extensive, and N. of the largest, Rukuhu, are large deposits of iron ore. Mineral production was valued at £1,250,907 in 1947. The prin. exports are sisal, coffee, cotton, diamonds, gold, rubber, beeswax, hides and skins, papain, wood and timber, tobacco, and gum arabic and copal. Imports comprise cotton-piece goods, foodstuffs, cigarettes, kerosene and motor spirits, machinery, building materials, iron and steel goods, spirits, and sugar. In 1947 exports were valued at £11,580,197 and imports at £13,723,925. Over 60 per cent of trade is done with the United Kingdom. In 1947 the Brit. Gov. began development of ground-nuts, planning the cleaning and cultivation of 5000 sq. m., the estab. of a deep-water harbour at Mikindani, and of a railway thence to Nachingwea (135 m. inland). The Great North Road from N. Rhodesia to Nairobi (Kenya) runs for 800 m. of its total length of 928 m. through T. Light motor traffic

is now possible over nearly 23,000 m. of road during the dry season.

Communication is maintained by ocean-going and coastal vessels, and by dhows. The chief ports are Bagamoyo, Kilwa, Mikindani, and Pangani; besides a number of lake ports for steamers, such as Mwanza, Bukoba, and Musoma on Lake Victoria, Kigoma on Lake Tanganyika, and Mwaya on Lake Nyasa. In 1949 plans were announced to develop Dar-es-Salaam into a major port. The Tanganyika Central Railway runs from Dar-es-Salaam to Kigoma (782 m.) with a branch to Mwanza and from Hogoro to Msagili (40 m.); Kalivva to Mpanda (148 m.); and Tanga to Arusha (272 m.), this line linking up with the Uganda line via Kahe and Voi. The gauge is one metre. T. T. railways were amalgamated with those of Kenya and Uganda in 1948. Air transport is assisting the development of the ter. Postal and telegraphic facilities exist at all the prin. centres, and there are sev. research stations.

Although this vast country, containing large areas of uninhabited, tsetse-infested, and waterless land, with a scattered pop. of 120 diverse tribes, has only been under Brit. administration for thirty years, there has already been a great advance in the social services. If, however, the ter. is ever to attain a position of economic independence, it would be undesirable to develop these services by subsidies under the Colonial Development and Welfare Act to a scale which it would be beyond the capacity of the local revenue to support. In extensive areas of the ter. there is no European settlement or it is so limited in extent as to have no effect on the availability of land for the use of the indigenous pop. Yet white farming has made, and must continue to make, an important contribution to the economic development of the ter. and to its revenues. There are in fact large areas in T. which are capable of development within measurable time only by non-indigenous effort. There are plans afoot for improving the railway communications with Dar-es-Salaam—a long overdue project. A recent conference on the future of game animals in T. proposed inviolable national parks (*q.v.*), with the suggestion of a 5-m.-wide 'buffer' strip between them and settled areas to replace the present system of game reserves. It was agreed that there should, in principle, be no human settlement or domestic stock inside the parks—a policy which will involve the removal, as a long-term plan, of the 8000 Masai (*q.v.*), with their 300,000 head of stock, now in the Serengeti National Park. In closely settled areas, however, game will not be protected, for the needs of man should be paramount, though the hunting of game by natives will, in general, be limited to the needs of the hunter and his family and will not include hunting for sale.

**Population.**—There are about 120 native tribes, mostly of Bantu origin, with in the N. a marked Hamitic strain. Swahili is the lingua franca. In 1947 the native pop. was 5,838,000; Asiatic 61,900; Euro-

pean 16,900 (including 6000 Polish refugees).

**Education.**—Three schools are maintained by the gov. for the primary education of European children, at Dar-es-Salaam, Arusha, and Mbeya. Assistance is given to eight privately maintained schools. For secondary education European children go to schools in Kenya, and bursaries are awarded for secondary education in Kenya and S. Africa. There are eighty-three Indian schools with a total enrolment of 9800 pupils. Schools for Africans are provided by the gov., the native administrations, and voluntary societies, the two latter being subsidised by a grant-in-aid system controlled by the Education Dept. Some 289 schools are maintained by the gov. or the native authorities. Primary schools are usually co-educational. The total enrolment is approximately 32,000 pupils. Assistance is given to 704 schools, including secondary schools, teacher training centres, and girls' schools run by voluntary agencies. The total roll is approximately 80,800 pupils. There are schemes of secondary and technical education. In the primary schools stress is placed on the improvement of rural economy. Industrial sections at the secondary schools teach carpentry, masonry, smithing, and tailoring. The gov. publishes a monthly journal in Swahili.

**History.**—Arab traders visited the ter. for sev. centuries and opened up the great slave route from Bagamoyo on the Indian Ocean to Ujiji on Lake Tanganyika. The Brit. explorer, Burton, first entered the ter. in 1856, and was soon followed by Speke, Livingstone, and Stanley. The ter. was visited in 1884 by Karl Peters, who concluded sev. treaties with the native chiefs and so paved the way for the estab. in 1885, of a Ger. protectorate. In 1889, an Arab revolt having been suppressed, the first Ger. steamer was launched on Lake Nyasa. A more serious rising took place in 1905 and was only crushed after some 120,000 natives had died either during the conflict or from its immediate results. After the First World War (for details of the campaign see AFRICA, GERMAN EAST, FIRST WORLD WAR, CAMPAIGN IN) an order in council was issued in Jan. 1919, appointing an administrator. The Tanganyika Order in Council, 1920, constituted the office of governor and commander-in-chief. In March 1921 the dist. of Ujiji and portions of the dists. of Bukoba and Ufipa, which had formerly been administered by the Belgians, were taken over. In 1920 the draft mandate for Ger. E. Africa was submitted to the Council of the League of Nations in favour of Great Britain and Belgium and approved in 1922. In 1926, by an order in council, provision was made for the constitution of a Legislative Council. In Feb. 1950 the Trusteeship Council of the United Nations, in adopting its report on T. as the outcome of long discussions on the ann. review submitted by Britain, congratulated Britain on its administration of the ter. On constitutional matters the Trusteeship Council recommended the

adoption of measures by which the people could be consulted and the views of tribal councils, political associations, and trade unions obtained and the consideration of a possible increase in African representation in the executive and legislative councils. See Sir D. Cameron, *My Tanganyika Service and some Nigeria*, 1939; R. Coupland, *East Africa and its Invaders*, 1939, and *The Exploitation of East Africa*, 1939; Charlotte Leubuscher, *Tanganyika Territory: a Study of Economic Policy under the Mandate*, 1941; *Tanganyika Guide*, 1936, 1948; and *Report on the Administration of Tanganyika*, 1947 (H.M.S.O.). 1948.

**Tangent** to a curve is the straight line which passes through two coincident points on the curve. In trigonometry the T. of an angle in a right-angled triangle is the ratio of the side opposite the angle to the adjacent shorter side.

**Tangent Sailing**, see GREAT CIRCLE.

**Tangerine** (*Citrus nobilis*), small variety of orange with a loose-fitting skin which is allied to the mandarin (*q.v.*). The fruit is pulpy, but the juice is sweet and fragrant.

**Tanghinin**, deadly poison extracted from a kernel of *Tanghinia venenifera*.

**Tangie**, see KELPIE.

**Tangier**, or **Tangers** (Lat. Tingis, Arabian **Tanja**), seaport of Morocco on a bay of the strait of Gibraltar, 36 m. S.W. of Gibraltar, the diplomatic headquarters and the largest commercial city of Morocco. Lying on the picturesque bank overlooking the Atlantic, the tn. is surrounded by old walls and dominated by a ruined *kashah* (fort). Most of the streets are impracticable for vehicles, and goods are carried by donkeys. The 'Great Sâk' (market-place) is the end of the Saharan and Sudan caravan routes. Exports comprise eggs, skins, and tinned fish. In 1944 exports were valued at 14,630,000 francs and imports at 181,357,339 francs. Cigarette manuf. is the most important industry, and there are fisheries, market gardens, and preserving industries. It is the N. term. us of the Tangier-Fez Railway.

T. was the cap. of a Rom. prov. It was taken by the Portuguese in 1471, and held by England, to whom it came as the dowry of Catherine of Braganza, from 1661 to 1684. It then came into possession of the Moors. By the treaty of Madrid (Nov. 1912) it was to become the centre of an international zone. For the hist. of T. as an international zone see Morocco, *Spheres of Influence and Government*. The police are of sev. nationalities with Belgian officers. The zone has an administrator, with assistant administrators for health, justice, finance, etc. There is an important Brit. colony of about 1200 people, and many Europeans have settled there. The education of Muslims is mainly confined to elementary Koranic schools, with sev. schools maintained by the Fr. and Sp. Govs. Native justice is administered by religious courts, and by the Mendoub, who tries a large number of civil and criminal cases, and as the sultan's representative supervises native affairs. A mixed tribunal is provided for cases involving

foreigners (except Amers.). The revenue comes mainly from customs and consumption duties. The ordinary budget estimates for the T. zone in 1946 were: receipts, 313,000,000 francs; expenditure, 305,000,000 francs. Actually receipts were about 600,000,000 francs and expenditure 325,000,000. Area 225 sq. m. Pop. 100,000 (16,500 Europeans, 7000 native Jews, and 36,500 native Muslims).

**Tango**, dance in 2-4 time, slightly faster than the Sp. *habanera*, originating in S. America. Introduced into Europe, it has become a standard ballroom dance.

**Tanguts**, tribe which inhabits parts of Kansu, in China, and the Kuku-Nor and Khan dists. in N.E. Tibet. They are of Mongolian origin and nomadic in character, their only wealth consisting of their flocks.

**Tanistry**, Pictish law of succession, see under PICTS.

**Tanjore**, **Tanjur**, or **Tanjâvûr**, tn., cap. of T. dist. of Madras, India, 170 m. S.W. of Madras. It has a famous, Hindu temple, the old palace of the rajahs and a dismantled fort. The chief manufs. are carpets, silks, jewels, and metal work. Pop. 68,700. The dist., which includes the delta of the Cauvery R., is very fertile. Area 3727 sq. m. Pop. 2,563,000.

**Tankersley**, tn. in the W. Riding of Yorkshire, England, 1½ m. S. of Barnsley. It has coal-mines. Pop. 2475.

**Tanks** (and **Anti-Tank Weapons**).

*Tanks and Self-propelled Artillery*. During the First World War the opposing armies occupied strongly entrenched positions opposite each other, and the ground between them and in the vicinity was ploughed up by incessant shell-fire, any roads being quite impassable for ordinary vehicular traffic. Consequently, owing to this difficulty of movement, coupled with the terrific machine-gun and artillery fire, it was almost impossible to develop an attack of any magnitude without enormous loss. To overcome this, the Brit. began experimenting with a kind of mobile fort consisting of a mechanically propelled vehicle capable of crossing very rough country by the use of caterpillar tracks, which was armoured and carried machine guns and six-pounders. The name tank was given to disguise the true nature of the machine being secretly constructed, and has stuck to it ever since. The first tank was designed in 1915, being produced in two types, 'male' and 'female'. The general shape was rhomboidal, all round the periphery of which ran the caterpillar-type track, and projections from the sides—'sponsons'—housed the guns. In the Mark I. class, the male carried two six-pounder guns and the female four Vickers machine guns. The tracks were driven by a specially designed six-cylinder petrol engine developing 150 h.p., through a two-speed gear-box under the control of the driver, from which the drive led through a differential to a pair of gear-boxes placed one on each side of the machine. Each of the latter gear-boxes, manipulated by a gearsman, controlled its own particular track by a chain-drive to the rear

sprockets. Manned by a crew of eight, these tanks were very ponderous and slow, having a maximum speed of only 4 m.p.h. In addition, this model had two steel wheels mounted by a hinge at the rear and pressed on to the ground by stout springs. Operated by the driver, these wheels assisted in the steering of the tank, but as experience proved them to be cumbersome and not worth the added complication due to their fitment, subsequent models were built without them. After their first use in actual battle, on the Somme in Sept. 1916, the Gers. began to use armour-piercing bullets, which necessitated stronger armour being fitted to the tanks subsequently constructed. Towards the end of 1916 new and lighter tanks were being experimented with which were capable of increased speed and manoeuvrability, each being controlled by one man. They were designed to be used beyond the main system of trenches, and as they had not to negotiate any very wide trenches they were made shorter in length. These came to be known as 'whippets,' and later officially as medium tanks. By the beginning of 1918 the ordinary tanks had been much improved by being fitted with a bigger, better engine of 225 h.p., one-man control, and able to attain a maximum speed of 12 m.p.h. A short time before the end of the war, designs were prepared for a very much improved type of tank which would be able to travel 20 m.p.h., propel itself, floating, across water, and carry enough fuel to enable a journey of 200 m. across country to be made. One of these was completed after the Armistice, but although its speed was above expectations, the many new devices incorporated in its design were unreliable and proved a source of weakness.

Tank design now crystallised into three types: *Light*, for reconnaissance, *Medium* or *Cruiser* to engage hostile armour; and *Heavy* or *Infantry* to accompany infantry in the attack. In general this classification can still be applied to-day. In 1940 Brit. armour still consisted largely of Vickers Mark VI. light tanks, armed solely with a water-cooled machine gun of rifle calibre. These tanks bore the brunt of Wavell's first Libya campaign, where they were opposed chiefly by It. light tanks L-3 and L-6 (Fiat-Ansaldo). The shortcomings of these It. models had already been exposed in the Sp. civil war but not remedied afterwards. To this class belonged also the Ger. Pz. Kw. I. and II. and the Fr. Chars 3511 (otchkiss) and 35R (enault). In the Brit. service the Amer. Stuart, fast and with relatively heavy armament, was adopted as the standard light tank in 1942.

Cruiser tanks became the decisive arm in the W. Desert, where the war resolved itself most nearly into a tank *versus* tank duel, and the Gers. brought all their ingenuity and skill to bear in the design of this class. Their Pz. Kw. III., IV., and V. (Special) could outrun and outshoot the Brit. Matilda and Valentine 'I.' tanks and Covenantar and Crusader cruisers, all of which mounted two-pounders. Ger. hull armour (and turrets) were better sloped to

cause ricochets; on Brit. 'I.' tanks it was too vertical, on Brit. cruisers too thin. Pz. Kw. III. mounted a 50-mm. anti-tank gun, Pz. Kw. IV. a short 75-mm. field gun, and Pz. Kw. V. (Special) a long 75-mm. anti-tank gun. The whole series Pz. Kw. I.-IV. had the same general low silhouette with wedge-shaped turret. Ger. cruiser design culminated in the Panther, which mounted a 75-mm. gun and owed its pyramidal shape to the Russian T. 34. Its nearest Brit. equivalent was the Centaur, employed in 1945 and capable of being transported by air.

Until 1943 the Gers. cannot be said to have competed in the 'I.' tank class. Their theory of armoured warfare demanded that the infantry support the tank and consolidate its gains, not vice versa, and they were content to observe the failure of the Brit. Matildas and Valentines (many of which were supplied to Russia) to support the infantry. Brit. 'I.' tanks were slow-moving and under-gunned though mechanically reliable. Nevertheless having given the 'I.' tank to the world in 1916, the Brit. persisted with this class and produced the Churchill (with only a 2-pounder—later 6-pounder—gun for its great weight of 39 tons), the Comet, and after the war the Centurion, which mount 17-pounders: 1913 saw the first true Ger. 'I.' tank, the Tiger, in action in Tunisia with its 88-mm. gun. The Brit. from 1942 onwards used Amer. Grant and Sherman cruisers as 'I.' tanks, also Canadian Rams. All these mounted a 75-mm. gun, but in the Grant this was mounted in the hull with consequently limited traverse. Other 'I.' tanks employed were the Fr. Char B (32 tons, 47-mm. gun) and the Russian K.V.I. (44 tons, 76-mm. gun).

An important invention of the inter-war years was the (Amer.) Christy suspension system, in which the track ran round a single tier of large bogey-wheels, the object being to make every tank convertible to an armoured car by simply removing the track and fitting tyres. Crusaders, Covenanters, T34s, and Panthers all had this feature. The Jap. had a Christy-suspension tank which could also run, with flanged bogies, on railway tracks. In the event the problem of moving tanks long distances by road was solved by the invention of the tank-transporter, whose broad-tyred wheels did less damage to the surface-metal.

Assault guns (*Sturmgeschütze*) were first used in May 1940 by the Ger. (notably 150-mm. field-pieces) for close support against defended buildings. The gun was mounted in a fixed armoured box on a tank-chassis (usually Pz. Kw. III. or IV., but also on chassis of Fr. or Czech tanks) with the ordinary traversing gear of a field carriage. Pieces varying in calibre from 75 mm. to 210 mm. were so mounted (including 88s.), and the series designated Hornet, Bison, Grizzly Bear, etc. Eventually they formed about half the artillery regiment of a Ger. armoured div. The Brit. adapted similar mountings from cut-down tanks for the 25-pounder (Priest, Deacon, etc.), and the Amers. used

75-mm. cannon on half-track chassis for regimental support companies. Such weapons are generically called 'self propelled' (Ger. *Selbstfahrlafette*). A thick frontal shield and a short-range piece, as in the Brit. Armoured Vehicle R.E. (an armoured mortar for point-blank use) characterise the assault gun proper. A similar development is the armoured flame-thrower, such as the Brit. Crocodile and the Ger. Pz Kw. 11. Flammenwerfer. Other adaptations of the tank chassis for special purposes are the armoured bulldozer and the 'Scorpion' flail tank for clearing minefields (see MINES).

**Anti-Tank Weapons.**—Since the armour-plating of the tank from its inception was designed to protect, and did so protect, its crew and its own vital parts from small-arms bullets, shrapnel bullets, and the splinters from high-explosive shells, these projectiles and the weapons which could project no other kind were useless against T. The development of special weapons and the special employment of other weapons for anti-tank purposes began after the battle of Cambrai in 1916. The Gers. brought into use a heavier type of rifle firing an armour-piercing bullet, and began to mount single field pieces which were dug in in the infantry positions with the sole task of engaging enemy T.

A specialised piece of ordnance for engaging T. requires a high muzzle velocity to ensure that the impact of the projectile on the armour shall be as violent as possible, and a flat trajectory, i.e. the path of the shell in flight must be as nearly as possible horizontal in order to ensure that the shell strikes the armour at right angles. These conditions are fulfilled to some extent by anti-aircraft guns, but few of them are designed to fire directly off the travelling carriage, and they thus take too long to bring into action in emergency. Further, their recoil mechanism and carriages are generally designed to absorb a downward recoil and are more or less difficult to modify for horizontal shooting. Some models, however, notably the Ger. Flak 88, the prototype of which was already in use in 1918, lent themselves well to such adaptation and could in emergency be used with armour-piercing ammunition in their anti-aircraft form.

Field-guns of all types (as opposed to howitzers) were used with varying degrees of success against T., either with high-explosive shell or armour-piercing shot and the largest possible propelling charge. Of these weapons the Fr. 75-mm. field-gun, which fires 'fixed' ammunition (propellant and projectile in one case), combined accuracy with a relatively rapid rate of fire. The Brit. 25-pounder gun-howitzer with breech-loading ammunition was not so quick, but equally accurate and delivered a heavier 'punch.' The Ger. 105 mm. as used by ordinary divisional artillery was not so effective as the 25-pounder, owing to its relatively short traverse and clumsy mechanism. But the introduction of hollow-charge ammunition (*Hohlladung*) gave the Ger. field

gunner a great advantage in this sphere. Hollow-charge ammunition consists of a metal shell filled like an ordinary high-explosive shell, but the cone at the front end of the shell is left empty and the forward service of the explosive filling is concave; as the force of an explosion is directed at right angles to the surface of the explosive substance, the whole force of the explosion is concentrated at the centre of the sphere of which the concave surface forms a segment, and a high velocity was no longer needed since it was not necessary for the shell itself to pierce the armour; nor need hollow-charge shells strike the armour at a right angle.

Apart from the necessity for a special carriage and special sights, there were other limitations on the use of field and anti-aircraft artillery against T. Battery positions could not in practice be sited so as to fulfill the requirements both of their primary and of their anti-tank role, and a time-consuming procedure was necessary whereby on the approach of T. control of the guns passed from the forward observation officer who normally directed their fire, to the gun-position officer who could see the T. and order salvoes against them by voice, or to the commanders of individual guns. If guns were detached and sited purely to engage T., then so much greater was the loss in normal artillery strength.

These factors had been appreciated by all armies by 1939 and special units, usually under divisional control, and armed with anti-tank guns proper, had been formed. At the outbreak of war the Brit. Army was armed with 25-mm. Hotchkiss and 2-pounder Vickers guns for this purpose, while the Gers. had 37-mm. and 50-mm. guns. The Brit. 6-pounder, introduced in 1941, matched the performance of the 50 mm., and was in turn outclassed by the Ger. 75-mm. Pak, to counter which the Brit. 17-pounder was brought into service in 1942. But all the time the Ger. 88-mm. anti-aircraft gun had been undergoing successive modifications, culminating in the 88-mm. Pak, which was specialised as an anti-tank gun as opposed to earlier models which could be used in an anti-aircraft or medium role. All these guns as well as the Amer. 75 mm. and the Ger. 120 mm. could also be mounted in T.

A special kind of ordnance incorporating the Gehrlich bore was developed by the Gers. and produced in 37-mm. and 50-mm. calibres. In addition to the semi-automatic breech, long barrel, and relatively large propellant for a small projectile which distinguish this type of gun, the Gehrlich guns had a bore which tapered slightly from breech to muzzle so that the shell was 'squeezed' out of the gun and flew with a pronounced boring motion.

Anti-tank guns accompanying infantry in the attack or on reconnaissance in force were vulnerable to attack by T., since on the move they were not only hitched to the towing vehicle but pointing the wrong way, and seconds lost in bringing them into action gave the enemy tank an overwhelming advantage. Smaller

types up to 6-pounder or 50-mm. calibre could be carried pointing forward and more or less ready to fire in special lorries, which were, however, conspicuous and formed an unsatisfactory fire platform. As the war progressed various forms of self-propelled carriage (usually converted from obsolescent types of tank), which allowed the gunner to fire forward from behind armour, were developed. The Allies, for instance, used the M10 (3-in. gun on Sherman chassis), and 17-pounders on Valentine chassis. A wide arc of traverse was not so necessary for these mountings, as the tracked carriage could readily be manoeuvred to bring the gun to bear. These armoured fire-platforms were a logical development of the assault mountings used for field-guns.

Anti-tank weapons for use by infantry of rifle companies (apart from special sub-units of battalions, etc., armed with anti-tank guns) were numerous and diverse. The experience of the Sp. civil war, the defence of Warsaw, and the Russo-Finnish war in 1939 showed that those which could be most readily and effectively improvised were grenades (*q.v.*), either incendiaries such as the 'Molotov cocktail,' ranging from a simple beer-bottle full of petrol to factory-made phosphorus bombs with time or percussion fuses, or high-explosive bombs. To engage beyond the range of a strong thrower, anti-tank rifles of about 4-in. calibre firing hardened steel bullets were used (*e.g.* the Brit. Boys rifle). These usually had a magazine of five rounds capacity, though the long Russian model was single-shot and had to be reloaded by hand. The Ita. used an automatic anti-tank rifle, the Solothurn, of Swiss origin. All these weapons were about 5 ft. long and made a heavy and cumbersome load for one man. From about 1942 onwards they tended to be replaced by various types of rocket projector, effective at about 100 yds. range and consisting of a simple tube with electrical detonating gear. Such were the Amer. Bazooka and the Ger. *Panzerschreck* or *Ofenrohr*, both of which were aimed by resting on the shoulder and loaded by a second man standing behind the firer. A smaller and simpler version of this weapon, called the *Panzerfaust*, was fired at some risk to the firer from under the arm-pit. The Brit. PIAT (projector, infantry, anti-tank) threw a similar rocket-propelled hollow-charge bomb, but was fired from the shoulder like a rifle and could be loaded by the firer. For anti-tank mines see under MINES.

**Tannenberg, Battle of:** 1. Fought from Aug. 26 to 30, 1914, in the neighbourhood of T. and the Masurian Lakes, resulting in a Ger. victory over the Russian armies invading E. Prussia. The Russians had planned to deal a counter-blow on the E. front while the Ger. armies on the W. front were marching on Paris, and the position was critical for the Ger. armies on the E. front. The victory estab. Hindenburg's fame as the greatest of the Ger. leaders, besides disposing for the rest of the war of any serious threat to E.

Prussia from the Russian quarter. After the Ger. defeat at Gumbinnen on Aug. 20, they fell back on Osterode, confronted by Samsonov's army of the Narew and Rennenkampf's First Army (of the Niemen). Hindenburg, with Ludendorff as chief of staff, took over the command, faced with the problem of driving the enemy out of E. Prussia. It was decided to leave only a cavalry div. to hold Rennenkampf's forces and to concentrate all the available Ger. forces for a lightning assault on Samsonov's army. A position was rapidly taken up from a point near Soldau on the S. to Osterode on the N. The Russians came up against the position and were thrown back. Seeben and Gross Koschlau were taken by the Gers. on the 26th, Urdau on the 27th, and Soldau on the 28th. Von François (1st Corps) then rushed his troops to Neidenburg and through it to hold the main road through Grunfless and Muschaken to Willenberg. The whole road was picketed by the 29th, and the retreat of three Russian corps cut off. The centre of the Russian forces was disposed in a close and wooded country, which impeded progress, and it was only on the 28th that Samsonov heard of the defeat of the flanking 6th Corps and realised that his own forces were caught as in a vice. The 13th Corps had actually reached Allenstein on the evening of the 27th, but on the 28th it was ordered southwards again towards Hohenstein, where the 15th Corps, terribly battered, was endeavouring to hold out against von Scholtz's corps. Still further S. the 23rd Corps was retreating to Lahna. Samsonov realised that his only hope was to turn the 15th and 13th Corps southwards to flank the 2nd Div. in an effort to break through at Neidenburg. But it was too late. Already the rout had begun; disorganised bodies of troops were hurrying eastwards, making helplessly for the shelter of the extensive forest dists. of Kaltenborr and Grunfless. Some 20,000 men of the 13th Corps, trapped near Hohenstein in marshy country, surrendered, but the rest of the corps succeeded in reaching the forest land—where all the exits were covered by Ger. artillery. Altogether only about 60,000 Russians escaped by one device or another. The Gers. took 90,000 prisoners. 2. Fought in 1410, between the Teutonic Knights of Prussia on one side, and the Poles and Lithuanians on the other. It resulted in a great victory for the latter, marking the emergence of Poland as a great power.

**Tannhäuser**, legendary Ger. knight, popularly identified with a wandering minnesinger of the thirteenth century. The legendary T. was also a wanderer, and finally came to the Venusberg or Hirsberg, near Eisenach, where he abandoned himself to sensual pleasures. Later he repented and went to Rome to beg pardon from the pope. Pope Urban said the forgiveness of his sins was as impossible as for his staff to blossom. T. left Rome, and in three days the pope's rod began to sprout. T. was sought for, but could not be found; he had returned to the

Venusberg. Wagner has treated the story in his well-known opera of this name.

**Tannin**, or **Tannic Acid**,  $C_{12}H_{10}O_6$ , occurs in gall nuts and all kinds of bark. It is extracted by boiling water and is an almost colourless substance readily soluble in water, and difficult to purify and crystallise. Its solutions possess a very astringent taste and with ferric chloride give a dark blue solution, and hence tannin is used in the manuf. of inks. T. is a glucoside of gallic acid and glucose, since it is converted into this acid by boiling with dilute sulphuric acid. Owing to its property of forming insoluble coloured compounds with many dyes, T. is used largely as a mordant and is also extensively employed in 'tanning' (see LEATHER). In medicine T. is employed in cases of diarrhoea, hæmorrhage, etc. T. is actually the name of a large class of related substances, the chief being Turkish T., Chinese T., and Hamamelis T. In recent years some synthetic Ts. have been obtained.

**Tanning**, see LEATHER.

**Tannu-Tuva** (formerly **Uryanthal**), see under MONGOLIA.

**Tantalite**, see under TANTALUM.

**Tantalum**, metallic chemical element, symbol Ta, atomic number 73, atomic weight 181.3. It occurs associated with niobium in the mineral 'tantalite' or 'columbite.' It is white in colour (sp. gr. 16.8) and can be drawn into wire of great tenacity and high fusing point (2850° C.). It was formerly used in constructing the filaments of electric lamps, but has now been replaced for this purpose by tungsten (q.v.). It is, however, used in the manuf. of acid-resisting chemical apparatus, and in electrical rectifiers. The pentoxide is obtained when the metal is burned in air.

**Tantalus**, legendary Gk. hero, son of Zeus and Pluto, and king of Sipylus, father of Pelops and Niobe. He was admitted to the table of the gods, but abused this privilege and was cast into the lower world, where he stood in water which ebbed away when he stooped to drink it. Above his head hung huge branches of fruits which swung out of his reach whenever he tried to grasp them.

**Tantalus**, or **Wood-ibis**, genus of wading birds of the Stork family (Ciconiidae).

**Tao**, Maori weapon, see under MAORIS.

**Taöism**, see LAO-TSZE.

**Taormina** (anc. **Tauromenium**), tn. and winter resort of Messina prov., Sicily, 30 m. S.W. of Messina. It was founded by the Gks. (c. 398 B.C.), and has the ruins of a magnificent theatre, remains of Rom. buildings, and a fourteenth-century Gothic cathedral and a palace. Pop. 4300.

**Tapestry** (Fr. *tapis*, carpet or table-cloth; Lat. *tapetum*, carpet), textile wall-hanging in which a design, often of a pictorial character, is woven on a loom by the use of different coloured threads in the woof. There is a distinction between high-warp and low-warp T. according as the warp is set vertically or horizontally. The weaver works from a full-scale cartoon. The word T. is sometimes less accurately used to describe an embroidered wall-

hanging, such as the Bayeux T. The word is also sometimes used of coverings of furniture or carpets, and a type of woollen embroidery on canvas is called T. work.

In antiquity woven and embroidered wall-hangings were widely used both in the E. kingdoms and in the Gk. and Rom. world, and are frequently mentioned in classical literature. Fragments of Ts. of the Hellenistic and Rom. imperial periods have been found in Egypt. In the Middle Ages Ts. were widely used to decorate domestic and eccles. buildings, and the art of weaving them is specially associated with France. The oldest surviving Fr. Ts. are the series of scenes from the Apocalypse from the cathedral at Angers, woven at the end of the fourteenth century at Paris. Later the centre of manuf. shifted N. to Arras, which became so famous for this work as to give its name to the product. In the sixteenth century the main centre shifted N. again, out of France to Flanders, and the famous Vatican Ts. of the lives of St. Peter and St. Paul were woven in Brussels between 1516 and 1519 after cartoons by Raphael which are now in the Victoria and Albert Museum, London. In the seventeenth century France again became an important centre with the estab. of the state factory of the Hôtel Royal des Gobelins by Louis XIV. in 1662. Other important Fr. factories were at Beauvais and Aubusson. Fine work continued to be produced during the eighteenth century, but in the nineteenth, while the technical skill remained, the artistic standard declined. In recent years there has been a remarkable revival of Fr. tapestry at the Gobelins and Aubusson factories, fine and original works being woven after the cartoons of contemporary artists. England, though famous for its medieval embroidery, called Opus Anglicanum, plays no great part in the hist. of T. weaving. Ts. were woven at the Sheldon works in the sixteenth century and at Mortlake in the seventeenth, and at Solihull in the eighteenth. The art was revived in the nineteenth century by Wm. Morris at the Merton Abbey works, where sev. fine Ts. were woven after the cartoons of Burne-Jones.

**Tape Worm**, see CESTODA.

**Taphros**, see PEREKOP.

**Tapioca**, see CASSAVA.

**Tapir** (*Tapirus*), genus of ungulates of the order *Perissodactyla* allied to the rhinoceros, but with a short, movable trunk, four front toes, and no horns, forming one of the oldest mammalian types. The skin is hairy and very thick, and the tail is rudimentary. They frequent forests and are nocturnal in habit, living chiefly on vegetable matter, though probably omnivorous. Of the five or six living species, one, the largest, is Malayan, and the rest occur in central and N. America, where they are often hunted. These are black in colour (though the young are striped in yellow and white), but the Malayan species has dirty white hindquarters. Though powerful they are shy and inoffensive and are easily tamed, and their use in suitable countries as

beasts of burden has been suggested. The thick hide is, however, of great value.

**Tapotement, or Percussion**, mode of diagnosis in medicine which, as its name implies, involves tapping and the eliciting of sounds. It was used by Corvisart for examining cases of heart disease, and was developed until it was of great value in the investigation of chest diseases by Laennec. Other physicians have made it of great value in diagnosing lung, heart, and abdominal diseases. In diagnosis by *direct* or *immediate* percussion the affected part is tapped with the three first fingers, or with a small rubber-tipped hammer, while in *mediate* percussion a *pleximeter* or flat ivory body is laid on the part and struck with the fingers or the hammer.

**Taprobane**, see CEYLON.

**Tapuya Language**, see under SOUTH AMERICAN NATIVE LANGUAGE, *Caribbean Area*.

**Tar**, dark brown or blackish viscous liquid obtained by the destructive distillation of coal, shale, peat, lignite, or wood. The prin. kind of T. is coal T. About 10 to 20 gallons are obtained from one ton of coal, the quantity depending on the source of coal and type of furnace used, e.g. vertical, horizontal, low temp., etc. The chief products obtained from coal T. are T. acids, creosote oils, naphthalene, anthracene, etc., from which a large number of important drugs, dyes, perfumes, disinfectants, and insecticides are made. Wood T. is obtained from fir, pine, and larch trees and is collected in cavities beneath the smouldering wood heaps or 'neilers' in which charcoal is prepared. It is a thick, harsh-smelling liquid. The watery portion (pyroligneous acid) contains acetic acid, methyl alcohol, and acetone. The tarry portion consists of creosote, resin, and pitch and finds a use in the preservation of timber and rope. Stockholm T., obtained from the pinewood, is used medicinally in the preparation of ointments for skin diseases.

**Tara**: 1. Vil. of Meath, Eire, on the Boyne, 6 m. S. of Navan. The Hill of T. (507 ft.) is famed in anct. Irish hist.: upon its summit is a stone, regarded as the stone of destiny, upon which the kings of Ireland were crowned. It was a royal residence until 560 and national assemblies were held, and in 980 the Danes were overthrown here. It was the scene of a battle during the rising of 1798.

**Taranaki**, dist. in the S.W. of the North Is., New Zealand, with an area of 3732 sq. m. and a pop. of 81,700 (Maoris 6200). Formerly forest-clad, most of the ground has now been cleared and is utilised for stock-raising, sheep-rearing, and dairy-farming, meat, wool, butter, and cheese being produced. New Plymouth is the cap. and port. It was in the T. dist. in 1860 that a war broke out with the Maoris (see under NEW ZEALAND, *History*).

**Tarantism**, or **Tarantulum**, epidemic dancing mania which spread over Europe in the thirteenth and fourteenth centuries, and persisted into the seventeenth century. The symptoms originated with a great dread of the bite of the tarantula, which, though sufficient to pierce the skin,

is found to be incapable of giving rise to the hysteria and other symptoms of the mania.

**Taranto** (the anct. *Tarentum*), fort. tn. and seaport of S. Italy, in the prov. of Lecce, on the N. extremity of the gulf of T. It has a fine eleventh-century cathedral, castle, bishop's palace, museum, hospitals, etc. Fishing and oil-refining are carried on, and there is a trade in olive oil, grain, oysters, mussels, etc. The is. St. Peter and St. Paul, each having a lighthouse, protect the harbour, which is fortified. It is a naval headquarters. After the fall of the Ostrogoths T. became part of the Byzantine Empire. The Normans took it in 1063, and it became a feudal principality dependent on Naples. In the harbour on Nov. 11, 1940, the Brit. Fleet Air Arm crippled three It. battleships and two cruisers (see further under NAVAL OPERATIONS IN SECOND WORLD WAR). A Brit. force sailed into T. Sept. 9, 1943, to capture the naval base. Pop. 138,000. See TARENTUM for anct. hist., etc.

**Taranto**, Gulf of, gulf of the Mediterranean Sea, bordered by the provs. of Cosenza, Potenza, and Lecce. It has a length of 70 m. and an average breadth of 20 m.

**Tarantula**, name for various large, formidable-looking spiders, European and Amer., but correctly applied to a few



TARANTULA

relatively small species of the genus *Lycosa*, found near Taranto in Italy. It is not more poisonous than other spiders of similar size. It burrows in the ground and catches its prey by pouncing on it and not by means of a web. See SPIDER.

**Tarare** (anct. *Tararum*), tn. in the dept. of the Rhône, France, 22 m. N.W. of Lyons. The chief industry is the manu. of muslins (introduced in the nineteenth century); silk, plush, and velvet fabrics are also made. Pop. 10,000.

**Tarascon**, tn. in the dept. of Bouches-du-Rhône, France, on the l. b. of the Rhône, 50 m. N.N.W. of Marseilles. The church of St. Martha, heavily damaged in the Second World War, is the chief building; there is a castle and a seventeenth-century tn. hall. The manu. include iron smelting and olive oil, and there is



trade in grain and fodder, etc. It is perhaps best known by Daudet's *Tartarin de Tarascon*. Pop. 8000.

**Tarawa**, colony headquarters of the Gilbert Is. (q.v.), W. Pacific. In the Second World War Betio Is. in the T. atoll was the site of a Jap. airfield and stronghold occupied by most of the 6000 Jap. troops in the Gilbert Is. The Amer. marines landed in Nov. 1943, with tanks and artillery, but only captured the stronghold after a fierce three-day struggle which cost them 3800 casualties.

**Tarawera Mt.**, peak of New Zealand, situated in the Hot Lakes dist. of the North Is., 90 m. N.N.W. of Napier. On June 10, 1886, an eruption destroyed the famous pink and white terraces of Rotomahana.

**Tarbert**, fishing vil. of Argyllshire, Scotland situated on T. Bay, 38 m. N.N.E. of Campbeltown, with an anct. castle, erected by Robert the Bruce. There is a good harbour. Pop. 2000.

**Tarbes**, cap. of the dept. of Hautes-Pyrénées, France, on the Adour R., 12 m. N.N.W. of Bagnères-de-Bigorre. There is a twelfth- to fourteenth-century cathedral. Originally a Rom. station, T. later was the cap. of Bigorre and a Protestant centre. It has saw-mills, tanneries, and potteries, an arsenal and noted markets, especially for horses. Pop. 41,900.

**Tarbolton**, tn. of Ayrshire, Scotland, on Fail Water, 6 m. E.N.E. of Ayr. Pop. 5100.

**Tarbrush**, see FEZ.

**Tardigrada**, **Bear Animalcules**, or **Sloth Animalcules**, order of Arachnida. They are microscopic animals living amongst damp moss. There are four pairs of short stumpy legs, each ending in a pair of claws; the body is covered by a thin cuticle. Some authorities regard the T. as related to *Peripatus* (q.v.).

**Tardiveau**, René, see ROY-LESQUE.

**Tare**, or **Vetch** (*Vicia sativa*), leguminous plant with trailing or climbing stems and compound pinnate leaves and reddish-purple flowers. The Ts. of the parable (Matt. xiii.) are probably darnel.

**Tarentum**: 1. (Gk. *Tarás*); modern

**Taranto**, Gk. colony in Italy, on the W. coast of the peninsula of Calabria. Its greatness dates from 708 B.C., when the original inhab. were expelled by a body of Lacedæmonian Parthenæ under the guidance of Phalaris. After being autonomous until the fourth century B.C., T. was occupied by the Gks., and in 272 B.C. was captured by the Romans. It revolted during the second Punic war, but was retaken in 207 B.C., and was subsequently an ally and (in 123) a colony of Rome. It was taken by the Saracens in 830. 2. Hor. of Allegheny co., Pennsylvania, U.S.A., 21 m. N.E. of Pittsburgh. It has manufs. of glass. Pop. 10,000.

**Tar Heel State**, see NORTH CAROLINA.

**Tarifa** (Rom. *Julia Joz* or *Julia Transducta*), seaport in the prov. of Cadiz, Spain, 20 m. W.S.W. of Gibraltar, a former Moorish tn. On the is. of T., to the S., Punta de Marroqui is the most southerly point in Europe. There anchovy fishing. Pop. 13,000.

**Tariff Reform**. In the nineteenth century the United Kingdom had shed her protective tariffs under the influence of the dominant *laissez faire* principle as applied to international trade, the repeal of the Corn Laws in 1846 chiefly marking the transition. *Laissez faire* principles were, however, in retreat in the latter part of the century, with increasing state intervention in industry, combination of employees and of employers, price agreements, etc. In 1903 Joseph Chamberlain made his proposal to abandon *laissez faire* in international trade by reforming the customs tariff so as to include duties whose primary purpose should again be protection rather than revenue. T. R. proposed an average 10 per cent on manufactured goods, 5 per cent on meat, dairy produce, etc., and 2s. a quarter on corn. These tentative proposals were later modified, but preference to colonial products was a feature throughout. T. R. was unsuccessful at the polls until the First World War swept this and other domestic issues aside. It was the great slump of 1931-32 that brought a general 10 per cent *ad valorem* tariff plus increased Imperial Preference (q.v.). Meanwhile the wartime McKenna duties had been followed by the Safeguarding of Industries Act (1921) and other measures of protection and preference. After the Second World War tariffs and preference (discrimination) are the subject of international conference. See also PROTECTION; CUSTOMS DUTIES; FREE TRADE, with bibliographies. See J. S. Nicholson, *A Project of Empire*, 1909, and H. G. Williams, *Through Tariffs to Prosperity*, 1931.

**Tariffs**. **Tariff** comes from the Arabic *tarif* (notification) via the It. *tarifa* (arithmetical, ratobook), and means (a list of) duties or customs to be paid on imports (usually) or exports; or the law imposing them. T. are imposed for protection or revenue purposes. Although the United Kingdom abolished protective T. in the nineteenth century a number of T. were retained for purely revenue purposes (on tea, coffee, wine, spirits, etc.), excise duties being imposed as necessary to offset any protective effect. T. may be levied on weight or value, percentage duties on value being known as *ad valorem* duties.

The article on customs duties (q.v.) discusses early Eng. T. and cites the consolidating enactments of 1787, 1853, and 1876. The same article, together with Free Trade (q.v.), gives an outline of United Kingdom T. since the Free Trade era. The latter article, with economics (q.v.), discusses developments since the 1930s and refers to the General Agreement on Tariffs and Trade (G.A.T.T.) of 1947. In the U.S.A. the first Congress, in 1789, enacted a tariff which served not only to provide revenue but also gave useful protection. After the 1812-15 war with Great Britain, T. were raised to stem the flood of Brit. goods, with further measures of protection up to early in the 1830s, when a tendency towards lower T. prevailed generally up to the civil war of 1861-65. After the

war the Republicans passed a number of high duty T. up to and including the Hawley-Smoot tariff of 1930, interrupted from time to time by lower T., such as the Wilson-Underwood tariff of 1913, promoted by the Democrats. The effect of the 1930 Act has been much reduced, following its amendment in 1934 by the Reciprocal Trade Agreements Act empowering the president to reduce duties by 50 per cent. By 1939 agreements had been made with twenty-one countries. Further powers were given later, and further reductions negotiated at Geneva in 1947 under G.A.T.T.

In his *Introduction to World Economics* (1947), E. M. Patterson cites figures giving some indication of tariff levels before and after the spate of protectionism that was associated with the great slump of 1931-32:

#### Tariff Levels: 1925

Over 40 %	Spain
Over 25 %	U.S.A.
20-25 %	Argentina, Hungary, Poland, Yugoslavia
15-20 %	Australia, Canada, Czechoslovakia, Italy
10-15 %	Austria, France, Germany, India, Sweden, Switzerland
5-10 %	Belgium, Denmark
Under 5 %	Netherlands, United Kingdom

From report, *Tariff Level Indices*, prepared for International Economic Conference, 1927:

#### Comparative Tariff Levels: 1937

465	Spain	118.3	United Kingdom
359.6	Turkey		
279	Germany	110	Argentina
239.4	Brazil	100	U.S. (base)
166	Greece	98	Japan
160	Hungary	96.8	Belgium
150.5	Italy	85	France
149	Mexico	76.3	Canada
130	Egypt	37.4	Netherlands
128	Switzerland	32.8	Sweden

From *How High are U.S. Tariffs?* (Amer. Tariff League, Inc., 1942).

See also PROTECTION.

**Tarik**, see GIBRALTAIR.

**Tarika**, see under SENSUAL.

**Tarin**, see SISKIN.

**Tarn**: 1. Dept. in the S. of France, once forming part of Languedoc, bounded on the N. by Aveyron. The chief rivs. are the Tarn, Agout, and Aveyron. There are two arrons., Albi and Castres. The cap. is Albi. Area 2231 sq. m. Pop. 297,900. 2. Riv. of France, rising in the Cévennes and flowing into the Garonne. The chief tns. on its banks are Albi and Montauban. Length 225 m.

**Tarn-et-Garonne**, dept. in the S. of France, formed from parts of Guienne (Bas-Quercy), Rouergue, Armagnac, and Languedoc. The chief products are cereals, fruit, and wine, and the chief manufs. woollen and silk goods. There are two arrons., Montauban and Castelsarrasin. The cap. is Montauban. Area 1440 sq. m. Pop. 164,300.

**Tarnopol**: 1. Region of the Ukrainian S.S.R. 2. Cap. of the above, 78 m. E.S.E. of Lvov. Pop. 35,900.

**Taro**, see COCCO.

**Tarots**, see CARDS, PLAYING.

**Tarpon** (*Megalops atlanticus*), giant herring plentiful in warm Amer. seas. It grows to a length of 7 ft. or more, and to a weight of over 200 lb., the scales, which are tough like thin horn and are made into ornaments, sometimes being as much as 5 in. in diameter.

**Tarquinius**, name of a family in early Rom. hist., to which the fifth and seventh kings of Rome belonged: *Lucius Tarquinius Priscus* (616-579 B.C.), fifth king of Rome, was beloved by his people on account of his wisdom and courage. He defeated the Latins and Sabines, and tradition relates that he also defeated the Etruscans. He is reputed to have modified the constitution and to have begun the building of the sewers and the Circus Maximus. He was murdered after a reign of thirty-eight years. *Lucius Tarquinius Superbus* (534-510 B.C.), the seventh and last king of Rome. His cruelty and tyranny obtained for him the surname of 'Superbus,' but, though a tyrant at home, he raised Rome to great influence and power among the surrounding nations. He defeated the Volscians and took Gabii. Owing to his son Sextus's rape of Lucretia, the wife of his cousin, T. Collatinus, T. Superbus and his family were exiled in 510 B.C. The people of Tarquinii and Veii took up his cause and marched against Rome, but they were unsuccessful. T. next obtained the help of Lars Porsona, king of Clusium, who marched against Rome, but was induced to make peace with the Romans. Thereupon T. took refuge with his son-in-law, Octavius Mamilius, who induced the Lat. states to declare war against Rome, but they were defeated in the battle of Lake Regillus. T. then fled to Aristobulus at Cumæ, where he died.

**Tarragona**: 1. Maritime prov. in the N.E. of Spain, bordering on the Mediterranean. On its fertile mt. slopes are vineyards and orchards, producing excellent wine and fruit. Olive oil, silk, wheat, and hemp are produced. There is much forest land, yielding valuable timber, whilst copper, lead, silver, limestone, and marble are found. Area 2426 sq. m. Pop. 360,900. 2. (Anct. *Tarraeo*), seaport and cap. of the above, at the mouth of the Francoli, 45 m. W.S.W. of Barcelona. Pop. 33,700.

**Tarshish**, in sacred geography a far-distant locality, rich in silver, iron, tin, and lead (Ezek. xxvii. 12). The largest ships of those days were called 'ships of Tarshish' (e.g. Ezek. xxvii. 25). It is commonly identified with the anct. Tartessus (*ῥαψαρσος*), situated in the S. of Spain, which in the eighth and seventh centuries B.C. was under Phœnician hegemony. Less probable is the identification of T. with Tarsus (*ῥαρός*), an anct. city in the plain of Cilicia, nearly 20 m. W.S.W. from Adana. c. 2 m. from Tarsus çayi (the anct. *Cydnus*).

**Tarsier** (*Tarsius spectrum*), small lemur-

oid primate, a native of the E. Indies. They are about the size of a small rat, have very large eyes, very long ankle bones, sucker-like disks on the fingers and toes. The T. lives in trees, is nocturnal in habit, and feeds mainly on insects. Its skull closely resembles the ape type.

**Tarsus**, city of Cilicia in Asia Minor, near the R. Cydnus, represented to-day by the modern Tersous. It was the bp. of St. Paul.

**Tartans**. The brilliant striped and checked material known in Gaelic as *breacan* (checked material) is said to have been noticed, even by the Romans, as characteristic of the Celtic peoples. From the earliest medieval times it had become distinctively Scottish, and in primitive times, at any rate, the number of colours in the *breacan* indicated the wearer's rank. Bright though the colours of the T. are in themselves, those formed with vegetable dyes were at a distance and amongst the heather much less noticeable than would be imagined, though for rough wear the heavier and darker cloth (*cath dath*), of soberer hue, was worn, and from this has evolved what are known as hunting T., often found in cases where the clan sett is particularly brilliant. Whilst the use of *feileadh-beag* or *breacan feile* are noticed by almost the earliest chroniclers, chiefs and chieftains who required to ride appear to have frequently worn the plaid and trews (*brùthhos*), viz. tight hose and breeches of *breacan* cut on the cross, and accounts of these occur in documents regarding both the Lord of the Isles and King James V.

The use of T. of different patterns or setts as a clan or family distinction is a feature peculiar to Scotland, and of the great social system of clanship in which the essential link is a theory of kinship between the chief and the people of the clan, though in the large clans subdivisions into chieftains and setts have arisen for historical reasons. The 'clan tartan' was prized not so much for its distinction as because it was the accustomed and ancestral sett peculiar to the race. In many cases, however, the sett had evidently a local or 'district' origin. Some of these from long tenure came to be associated with the dominant clan, others have to this day remained 'district setts' appropriate for wear by any one connected therewith, irrespective of name. Other setts appear to have been from quite an early period associated with a certain clan or family, rather than with a dist. These are the clan T. It was, of course, not until late in hist. that such distinctions were consciously recognised, for an anct. system of dress or identification is seldom deliberately invented, but grows through centuries of custom. The colours of the T. were originally chosen because they pleased their wearers, and it was probably by no deliberate intent, but by continued repetition and sustained connection with successive generations, that these became indolibly associated with clan or dist., as the case might be.

The use of clan T. by border and lowland houses has sometimes been criticised,

but by the early eighteenth century, and at the date of the Union, 1707, the tartan garb of the old kingdom of Alban had come to be recognised as the national garb of Scotland, and, as such, was freely worn in the cap, and adopted in 1715 for the uniform of the Royal Company of Archers, whilst the border clans also adopted T. about this period. After the Jacobite rising of 1745 the use of T. and highland dress was suppressed by an Act of Parliament, which was not repealed until 1782, and this unhappy suppression not only involved the loss of many of the old clan setts, but has rendered it difficult to determine with certainty the antiquity of many patterns, a number of which date only from those which were hurriedly devised to meet the demand which arose when the Act was repealed. In recent years many scraps of older clans and dist. designs have come to light, and many of these are being again called into use. It has to be recollected that accuracy in detail was not a feature of medieval life, and that often a general hue was what mattered, rather than the detail of a sett, which might depend upon the fortuitous presence or absence of some particular dye.

The dyes used by the highlanders in colouring their T. were produced from lichen roots and highland plants, the colours so produced being mellow and more lasting than the somewhat harsh tints of nineteenth-century aniline dyes. Moreover the texture of the old T. was much harder, and examples of these old materials, from one to two hundred years old, are still in existence with their colours as bright as on the day they were made.

See Wm. Anderson & Sons Ltd., kilt-makers, Edinburgh, *The Scottish National Dress* (6th ed.), from which the above article is reprinted, with permission. See also R. Bain, *The Clans and Tartans of Scotland*, 1938, and Sir Thomas Innes of Learney, *The Tartans of the Clans and Families of Scotland*, 1938, 1947.

**Tartar**, see CAUCASUS; TATAR REPUBLIC.  
**Tartar Emetic**, or **Potassium Antimonyl Tartrate** ( $C_4H_4O_6K(SbO) + 4H_2O$ ), prepared by boiling potassium hydrogen tartrate with antimonious oxide and water. It is readily soluble in water, and is used in dyeing as a mordant and in medicine as an emetic.

**Tartaric Acid**, or **Dihydroxysuccinic Acid** ( $C_4H_4O_6$ ), commonly occurring vegetable acid, contained in grapes and other fruits. During the later stages of the fermentation of grape-juice, impure potassium hydrogen tartrate or argol is deposited. From this salt the commercial acid is prepared.

**Tartar Republic**, see TATAR REPUBLIC.  
**Tartars and Tartary**, see TARTARS.

**Tartarus**, son of Æther and Gæa, and by his mother Gæa the father of the Gigantes, Typhæus and Echidna. In the *Iliad* T. is a place beneath the earth reserved for the rebel Titans, as far below Hades as heaven is above the earth. Later poets use the name as synonymous with Hades.

**Tartu**, see YWRHFF.

**Tar, Wood**, see TAR.

**Tascher de la Pagerie, Joséphine**, see JOSEPHINE, MARIA ROSE.

**Tashi**, or **Tesho Lama**, see under LAMAISM.

**Tashkent**: 1. Region of the Uzbek S.S.R., with the Kazakh S.S.R. to the N., the Kirghiz S.S.R. to the N.E., and the Tadzhik S.S.R. to the E. and S. 2. Cap. of the Uzbek S.S.R., the largest city and the cultural and economic centre of central Asia, on a trib. of the Syr-Daria. 160 m. N. of Samarkand. Pop. 590,000.

**Tasman, Abel Janszoon** (1603-59), Dutch navigator and explorer, b. at Lutjegast. After journeys in China and India, he was sent by the Dutch East India Company to investigate the extent of Australia. He discovered Van Diemen's Land, later renamed Tasmania, in 1642, and also New Zealand, the Fiji and Friendly Is., and the gulf of Carpentaria. His jour. appeared in an Eng. ed. in 1898.

**Tasman Glacier**, in the S. of the South Is. of New Zealand, discovered in 1862 by Julius von Haast. It has a total area of just over 20 sq. m., and lies practically at the base of the mt. heights of the Southern (New Zealand) Alps.

**Tasmania**, one of the seven states of the Commonwealth of Australia, an is. separated from Victoria by the Bass Strait, which is about 140 m. wide. It lies between the parallels of 40° 40' and 43° 38' S. lat., and 144° 30' and 148° 30' E. long. A little smaller than Scotland, it is the smallest of all the Australian states as well as the most temperate and pleasant. The N. coast forms a concave curve flanked by the is. groups of Furneaux (E.) and the Hunter and King Is. (W.). The N. and W. coasts are not greatly indented, but have some good harbours. The E. coast is much more indented, whilst the S. and S.E. coasts are formed of a series of curiously shaped peninsulas. Area, including dependent is., 26,263 sq. m. Pop. 257,100.

**Physical Features**.—It is conjectured that T. was once part of the mainland, the is. in the strait being, it is supposed, part of a mt. range that connected the two lands. T. is a beautiful, well-watered is., rich in harbours and inlets, crossed by high mt. chains, full of crags, glens, and ravines of bold appearance, the basaltic cliffs of some being sev. hundred feet in height. On the coast there are good anch. orages, and many excellent harbours.

The prin. is. belonging to T. are over fifty in number, the Furneaux group, at the E. end of Bass Strait, and off the N.E. corner of T., including Flinders Is., with an area of 800 sq. m.; Cape Barren Is., 170 sq. m., and Clark Is., 30 sq. m.; beside these are Chappell Is. and Kent's Group, aggregating about 40 sq. m. On these is. live a number of so-called half-castes, descended from the offspring of sealers and native women. Strictly, however, they are of mixed and almost untr. accable ancestry.

T. has two mt. chains, separated by the cen. tal dist., through which is the communication between the N. and S. of the is. That to the E., or the dividing

range, has an average height of 3750 ft., and runs nearly N. and S., parallel with the E. coast. Among the peaks are Row Tor, or Mt. Arthur, 3895 ft.; Mt. Barrow, 4664 ft.; Mt. Victoria, 3900 ft.; Ben Nevis, 3900 ft.; and Ben Lomond, 5160 ft. The W. chain is an elevated table-land, averaging 3000 ft. in height, in the centre of the is., which contains all the large lakes and from which branch many ranges in all directions except eastward. From this table-land spring the peaks, Table Mt., 3600 ft.; Barn Bluff, 5115 ft.; Mt. Field West, 4700 ft.; Cradle Mt., 5069 ft., and a number of others over 4000 ft. In the S. is Mt. Wellington (4166 ft.), at the foot of which is Hobart.

The is. is well watered, and abounds in rivs., rivulets, and creeks, many of them rising from the lakes of the table-land, the average fall to the sea being estimated at 93 ft. per m. The prin. rivs. are the Derwent, about 130 m. long (on the estuary of which is Hobart, with a deep and sheltered harbour accommodating the largest vessels afloat), which issues from Lake St. Clair, receiving in its course the Rs. Nive, Dee, and Jordan from the N., and the Florentine and Russell from the S.; the Huon, about 100 m. in length, issuing from Lake Edgar, along whose shores the great apple orchards of the state are situated, and which receives the Crocroft and Pictou from the S., and the Weld and Russell from the N., and falls into D'Entrecasteaux Channel; the Coal R., rising in the E. chain of mts., and running S. into Pittwater. The mouths of these three rivs. are to the S.E. of T. To the S.W. and W. are the Davey R., the Spring, the Gordon, with tribs. the Wedge, Denison, Serpentine, and Franklin Rs., falling into Macquarie Harbour; King R., with its tribs. the Queen and Eden, also falling into Macquarie Harbour; the Pieman R., consisting of the Rs. Mackintosh, Murchison, Huskisson, and Donaldson; and the Arthur R.—these two last falling into the Southern Ocean. On the N., flowing into Bass Strait, are the Montagu, the Duck, the Ingalls, the Mersey, and the Tamar (the last-named being navigable up to Launceston by inter-state steamers, or 40 m. from its mouth). The R. Gordon and King R. on the W. coast are of remarkable beauty. To the N.E. are the Piper, Little Forester, and Trent, rising in the W. slopes of Mt. Victoria and debouching into Ringarooma Bay. Flowing to the E. are the Anson, emptying into Anson Bay, the George, into George's Bay, Scamander, and Swan.

The W. coast of T. is bold, rocky, and inhospitable, but there are sev. accessible ports. The chief harbours are: on the W. coast, Port Davey (formerly much frequented by whaling vessels), Pieman R., and Macquarie Harbour; on the N. coast, Stanley, at Circular Head, Emu Bay, and Port Frederick, at the mouth of the Mersey; on the E. coast, George's Bay, Oyster Bay, Prosser Bay, Spring Bay, and Fortescue Bay. The S. and S.E. of the is. is studded with safe bays and harbours, the prin. being Port Arthur, Storm Bay, Norfolk Bay, Frederick

Henry Bay, D'Entrecasteaux Channel, Port Espérance, and Southport.

There are numerous extensive freshwater lakes on the elevated table-lands, the largest being the Great Lake, in the co. of Westmorland (3822 ft. above sea level), covering an area of upwards of 40 sq. m.; Lake Sorell, in the co. of Somerset, about 20 sq. m.; Lake St. Clair; Arthur Lake, and Lake Echo. These lakes form the head-waters of the prin. streams flowing S., W., and N.

**Production, Manufactures, etc.**—The vegetation of T. is practically identical with that of Australia; the eucalyptus is the most predominant feature. Of the 16,500,000 ac. comprised in the state, over 10,000,000 ac., mostly mt. land, are malienated, of this area some 2,750,000 ac. being leased. The chief farm crops are wheat, oats, peas, turnips, potatoes, hay, and apples. Cereals of all kinds and root crops thrive in most parts of the is., the soil of decomposed basalt situated in the N.W. and N.E. being especially fertile. Hops grow well in the S. and the Tasmanian fruits—particularly apples—are well known. Apple production exceeds 7,000,000 bushels. Potatoes and mixed farming are accountable for much of the prosperity of the state. Wool production has reached an ann. value of nearly £3,000,000, butter production was nearly 11,000,000 lb. in 1947-48, and cheese over 1,000,000 lb. The chief minerals are copper, tin, silver, lead, zinc, gold, coal, and osmiridium. The total value of mineral output in 1947 was over £1,200,000. A rich copper-mining industry exists at Queenstown on the W. coast, that part of the is. being the chief source of minerals. Forestry is a great feature of T. The chief timber is the hardwood variety (eucalyptus), and the chief export timbers are the stringy-bark and blackwood, the former being used for bridges, railway sleepers, etc., and the latter for furniture and cabinet work. Other woods are huon, celery-top, and King William—all species of pine. Industries include woollen mills, jam and fruit-preserving factories, butter and cheese factories, tanneries, bricks and pottery, saw-mills, joinery and furniture, engineering, railway works, flour mills, boot and shoe factories, printing, and paper-pulp making. In 1947-48 exports were valued at £426,815,841, the prin. items being butter and cheese, fruit, preserves, copper, peas, potatoes, wool and woollen manufs., zinc, timber, and hides and skins. Imports were valued at £426,281,591. The two important manufs. for export are metal extraction and fruit preserving. Cheap electric power is a strong factor in the prosperous industrial hist. of the state, the Great Lake being a chief source. The chief tns. and centres are linked up with the railway system, which comprises 800 m. of track (614 being state-owned). Chief tns.: Hobart (cap.) city (pop. 57,000; with suburbs, 77,000), Launceston with suburbs (41,000), Devonport (8000), Burnie (8000), Deloraine, Latrobe, Lilydale, Scottsdale, Oatlands, Ross, New Norfolk, Geevestown,

Sorell. There is a univ. of T., estab. in 1890. Most of the primary teaching is at state schools. Secondary education is about equally divided between state high schools and the older endowed schools. There are also sev. technical schools. There are a supreme court, courts of petty sessions and general sessions.

**History and Government.**—T. was originally called Van Diemen's Land and was discovered by Tasman on Nov. 24, 1642. In 1777 it was visited by Cook, who thought it formed part of the mainland. Lt. Wm. Bligh planted Eng. fruit trees at Adventure Bay on Aug. 17, 1788, on the outward voyage of the *Bounty* to Pitcairn Is. It was proved an is. by circumnavigation by Bass and Flinders in 1798. Other notable explorers who visited the is. were Du Roesne (1772) Furneaux (1775), D'Entrecasteaux (1792-1793), and Hayes (1794). The earliest settlement, mostly of convicts, was estab. under Lt. Bowen at Risdon, on the R. Derwent, by Governor King of New S. Wales, in 1803. In 1804 another expedition reached Port Dalrymple (Tamar R.) and formed a settlement at George Town. The is. was used as a penal settlement, and increasing numbers of convicts were sent there after transportation to Australia had ended. The system ceased in 1853. In 1825 the is., which had previously formed part of New S. Wales, was proclaimed a separate colony, and in 1856 the name of Van Diemen's Land was changed to T. and responsible gov. granted. In 1901 T. united with the states of the mainland in establishing the Commonwealth of Australia. Parliament is bicameral, the House of Assembly (thirty members) being elected by adult suffrage by proportional representation by single-member votes in six-member constituencies, and the Legislative Council (nineteen members), with limited adult suffrage. The king is directly represented by the governor, who presides over the Executive Council. T. elects five members of the Commonwealth Lower House and six of the Upper House.

**Aborigines.**—These numbered in 1803 about 5000, but the pure aboriginal is now wholly extinct.

See H. L. Roth, *The Aborigines of Tasmania* (2nd ed.), 1914; J. B. Walker, *Early Tasmania*, 1914; G. Wittram, *Western Tasmania*, 1914; R. W. Giblin, *The Early History of Tasmania*, 1928; 39: State Development Board, *Tasmania: its People and Possibilities*, 1929; G. L. Wood, *The Tasmanian Environment* (2nd ed.), 1930; C. Barrett, *Isle of Mountains*, 1948; and *Tasmanian Almanack* (ann. pub.).

**Tassigny, Jean de Lattre de** (b. 1889), Fr. soldier, b. at Mouillereau-Pareds. He served in the First World War, and in 1940 was a general of div. In 1943 he escaped from imprisonment and joined Gen. de Gaulle. T. commanded the invasion force at Elba and the Fr. contingent in the allied landings near Marseilles in 1944. His First Fr. Army took part in the subsequent defeat of Germany. From 1945 to 1948 he was inspector-general of the Fr. Army, and in the latter

year became commander of the land forces of W. Europe.

**Tasso, Torquato** (1544-95). It. poet, son of Bernardo T., also a poet, b. at Sorrento. *See under ITALY, Language and Literature.*

**Taste**, in physiology, sensation caused by the application of certain substances in solution to organs situated on the tongue, and to a lesser degree on the soft palate, the uvula, and adjacent structures. Four Ts. are usually identified—sweet, bitter, acid, and saline. All the other delicately differentiated sensations usually referred to the sense of T. are really smell sensations.

**Tatar, or Tartar, Autonomous Soviet Socialist Republic**, autonomous republic of the R.S.F.S.R., formed May 27, 1920. It is bounded on the N. by Marish, Vyatka, and Votyak, on the E. by Molotov and Bashir, on the S. by Samara and Ulianov, and on the W. by Chuvash. The R. Volga runs through it from N. to S., and its trib., the Kama, from E. to W., joining the Volga at Spask. The cap. is Kazan, since the revolution an important manufacturing centre, on the Volga. Pop. 402,000. There is a univ. at Kazan. Much of the area of the republic is covered with forests of oak, pine, fir, and other trees, and timber is an important industry. There are also extensive pastures which support sheep, from whose wool good cloth is manufactured. There are large iron-works and a powerful regional electric power station in Kazan, and cotton materials are made. Candles and soap are manufactured, and the T. republic is the source of the famous Russian leather. Area 25,950 sq. m. Pop. about 3,000,000. In the fifteenth century a T. kingdom was formed, with Kazan as its cap.; later Ivan III. made it a vice-regency. In the middle of the sixteenth century Ivan the Terrible incorporated Kazan with his own dominions, and the prov. of Kazan was formed in 1708.

**Tatars**, peoples of mixed ethnic linguistic, and cultural origin, nowadays speaking Turki languages, professing the Islamic religion with Shamanist influences, and inhabiting the steppe region of E. European Russia, Central Asia, and Siberia. The meaning of the term T. is unknown. The word T. appears in the Orkhon inscriptions (q.v.) of the eighth century A.D., and in later Chinese and Arabic sources, and refers to peoples speaking Mongolian languages and inhabiting the border regions of China, the ter. of present Mongolia and some neighbouring dists. It was later applied to Mongols of Genghis Khan, and particularly to Turki peoples, such as Bulgars, Qipchaks, Turkomans, and others, who preceded and followed the Mongolian invasion of Europe. In the fourteenth century the name Tartary was applied in W. European languages to a vast ter. (corresponding partly to S. Russia, and Central Asia) inhabited by T.

**Tatary**, *see under* TATARS.

**Tate, Nahum** (1652-1715), Irish poet, b. in Dublin, where he studied at Trinity College. He issued sev. vols. of poems, and was the author of some indifferent

plays, including an adaptation of *Icar*, which was defended by Dr. Johnson and kept the stage till late in the nineteenth century. His poem, *Panacea, a Poem on Tea*, is his best original work: the hymn, *While Shepherds watched their Flocks by Night*, is attributed to him. In 1692 he became poet laureate, and ten years later was made historiographer-royal. He is best remembered as the Tate of Tate and Brady's metrical version of the Psalms (pub. 1696).

**Tate Gallery, The**, at Millbank, London, S.W.1, contains the national collection of Brit. painting from the sixteenth century to the present day, of modern foreign painting from approximately 1800, and of modern sculpture. The T. G. contains unique collections of work of Turner and Blake, also one of the best collections in Europe of French Impressionists. Sir Henry Tate (1819-99), Brit. merchant and art patron, financed the building of the gallery on the site of Jeremy Bentham's 'Model' Penitentiary, and it was opened by King Edward VII. as Prince of Wales in 1897. This housed the Tate gift of sixty-five Brit. paintings, the collection purchased under the terms of the Chantry Bequest (q.v.) the Vernon Collection, bequeathed in 1847, and the Watts gift. Sir Henry Tate made possible the addition in 1899, of eight further galleries, and in 1910, through the generosity of Sir Joseph Duveen senior, the wing to house the Turner bequest of 1856, which had been in the possession of the National Gallery, was opened, while his son, Lord Duveen, gave an immense sculpture hall, opened in 1937. The nucleus of the collection of modern foreign art was estab. by the bequest of Sir Hugh Lane (q.v.) in 1915, and the endowment by Samuel Courtauld (q.v.) in 1923. The T. G.'s collections have been greatly enriched by many other bequests and gifts. During the Second World War the gallery was severely damaged, but repairs were carried out; the T. was partially reopened in 1946 and by 1949 all repairs had been completed.

A series of important exhibitions have been held since 1946, including those of the works of Blake, Van Gogh, Chagall, Rouault, and Matisse, Richard Wilson, Alexander Coons, and others.

**Tatius, Achilles**, *see* ACHILLES TATIUS. **'Tatler, The'**, weekly jour. pub. in London dealing with contemporary events in the social and theatrical worlds. Though largely pictorial it has a high literary content in continuation of the traditions of its founder, Sir Richard Steele (q.v.) who first pub. this jour. in 1709, writing for it 'The Lucubrations of Isaac Bickerstaff.' Addison (q.v.) who discovered the identity of the author at the eighteenth ed., became a contributor thereafter.

**Tatra Mountains**, *see under* CARPATHIANS.

**Tatsienlu**, Tibetan name of Kangtrung, cap. of Sikiang prov., China.

**Tattersall's**, name of the firm estab. in 1766 by Richard Tattersall for the purpose of selling horses by public auction. It transferred from Hyde Park Corner to

Knightsbridge Green in 1865, where the London offices still remain. To-day large bloodstock auctions are held at Park Paddocks, Newmarket, and at Glasgow Paddocks, Doncaster, at fixed times annually.

**Tattershall**, vil. of Lincolnshire, England, 8 m. S. of Horncastle. It has a famous castle, built about 1440, which is one of the finest and earliest examples of E. Anglian brick-work in England. It was bequeathed to the National Trust in 1926 by Lord Curzon, who had restored it. Pop. 400.

**Tattooing** (Tahitian *ta* = mark), custom of marking the skin with incisions which are filled with a colouring matter to produce an indelible stain. It is practised mostly by primitive peoples of light skin colour, the Polynesians, the Maori (*q.r.*), the Amer. Indians, and, to a limited extent, the Jap. The darker-skinned people, such as the Australian aborigines, practise scarifying, i.e. raising scars by rubbing an irritant into incisions instead of a coloured pigment, as the colour would not be so effective a decoration on their dark skins. T. was practised by Palaeolithic man, and figurines from the S.E. European Neolithic cultures have been found which are covered all over with spiral decorations. Among the Thracians it was a sign of rank. Caesar mentions the painted bodies of the Britons, and the Picts may have received their name from their practice of painting or T. The custom must have been widespread in prehistoric times. In later periods it was used mostly for identifying convicts and slaves. In the Brit. Army, until 1876, the letters B.C. = bad conduct, and D. = deserter, were still tattooed on soldiers. Now in civilised communities it survives among only certain sections of the pop., mostly sailors, as ornament, but it can be used to disguise birth-marks, or even to remove them, a neutral-coloured pigment being injected to obliterate any discoloration of the skin. Its origin lies in the desire to heighten personal attractions or else to make the individual look more terrifying in war. Among primitive people it is part of the initiation ceremonies at the time of puberty, boys and girls being tattooed between the ages of twelve and sixteen. Some peoples tattoo only on the face, others on the back, chest, arms, and thighs also, usually in a curvilinear decoration. The Amer. Indians tattoo the sign of their totem on those being initiated. In Polynesia it has been brought to a fine art. It is done with a sharp bone with the end cut into teeth, which is dipped in a solution of charcoal or cinnabar to produce black or red markings respectively. The tattoo lines follow and accent the features. The practice is now declining under the influence of the missionaries. See A. Lacasagne, *Les Tatouages*, 1881; H. G. Robley, *Moko or Maori Tattooing*, 1896; G. B. Sanson, *Japan*, 1946; and F. V. Scholes and R. L. Ross, *The Maya Chontal Indians of Acalan-Tixchel*, 1948.

**Tau**, see under CROSS.

**Tauber, Richard** (1892-1948), Austrian-

born Brit. singer and composer, b. at Linz. He studied music at Frankfurt-on-the-Main and Freiburg, and trained as a conductor for about two years. In 1913 he made his first appearance as a singer in opera, in Mozart's *Magic Flute*. He rapidly became a favourite on the European operatic stage, but later turned to operetta. He appeared in *The Land of Smiles* in London in 1931. T.'s compositions included the music for *Paganini* (1937) and *Old Chelsea* (1943). Critics frequently regretted his desertion of opera for operetta, since he was one of the outstanding tenors of his age. He became a Brit. subject in 1940. See life by Diana Napier Tauler, 1949.

**Taucha**, tn. in Saxony, Germany, 5½ m. E.N.E. of Leipzig. Pop. 6575.

**Taunton**: 1. Municipal bor., mrkt. tn., co. and assize tn. of Somerset, England, 30 m. N.E. of Exeter, 45 m. S.W. of Bristol. It is situated in the heart of the fertile valley of T. Deane and is sheltered on the N. and S. by the Quantock and Blackdown Hills. St. Mary Magdalene par. church is a stately Perpendicular fifteenth-century building, noted for its double aisles and monuments and for its fine tower. Other buildings of note are a twelfth-thirteenth-century leper house or leper hospital; Priory Barn, sole relic of an important twelfth-century Augustinian priory; and Gray's Almshouses (1635). T. castle is a Norman and Edwardian building and stands on the site of a Saxon fort. It contains the Great Hall in which Judge Jeffreys held his 'Bloody Assize.' Part of the municipal buildings originally housed the sixteenth-century grammar school, now known as King's College. T. is an agric. centre. Manufs. include shirts and collars and other textiles; leather goods; gloves; aeronautical instruments; agric., mining and other machinery; and cider. It is the seat of a suffragan bishop. T. existed in Saxon times, and had a market before the Conquest, though its last charter of incorporation was not granted until 1877. During the Civil war T. was held for Parliament, and later in the same century it witnessed the proclamation of Monmouth as king, and the brutalities of Judge Jeffreys and Kirke's 'lambs' (it was from the signboard of the White Hart Inn, now a shop, that Col. Kirke hanged Monmouth's rebels). The bor. is part of a co. constituency which returns one member to Parliament. Pop. 35,700. 2. City of Massachusetts, in Bristol co., of which it is the co. seat. It manufs. cotton goods, machinery, jewellery, stoves, and silver articles. It is about 30 m. from Boston. Pop. 37,400.

**Taurica Chersonesus**, **Tauric Chersonese**, or **Tauric Peninsula**, see CRIMEA.

**Taurine** ( $C_2H_7NSO_3$ ), amidoethylsulphonic acid, a crystalline substance produced in the decomposition of bile.

**Tauromenium**, see TAORMINA.

**Taurus**, or the Bull, second sign of the zodiac (symbol ♉), contains the two well-known clusters, the Pleiades and the Hyades, the former being embedded in nebulous matter. The well-known Crab

nebula is also in this constellation, and the bright star Aldebaran (*q.v.*). Amongst other interesting objects in T. are the stars  $\zeta$  and  $\lambda$ , the former a spectroscopic binary with a period of 138 days and the latter an eclipsing binary like Algol, the period being 3.9 days. Boss studied the Hyades cluster and showed that the motion of its stars was convergent. The average distance from the earth of the stars in this cluster is 120 light-years.

**Taus**, *see* DOMAZLICE.

**Tautog**, or **Black Fish** (*Tautoga onitis*), food fish which occurs off the Atlantic coast of N. America. It averages from 12 to 14 lb. and is much valued in Amer. fish markets.

**Tautomerism**, or **Dynamic Isomerism**, in chem., the phenomenon exhibited by various substances that appear to have two different constitutions. Thus ethyl acetoacetate in some of its reactions appears to have the constitution  $\text{CH}_3\text{CO}\cdot\text{CH}_2\text{COOC}_2\text{H}_5$ , while in others its behaviour corresponds to the formula  $\text{CH}_3\text{C}(\text{OH})\cdot\text{CH}(\text{COOC}_2\text{H}_5)$ . It has been shown that substances exhibiting T. are usually equilibrium mixtures of the two tautomeric forms. Both forms of ethyl acetoacetate have been isolated by Knorr.

**Tavastehus**, or **Hämeenlinna**, cap. of the dept. of Häme, Finland, 60 m. N.N.W. of Helsinki. Its castle, dating from the Middle Ages, was formerly used as a prison. Sibelius was b. in T. Pop. 6500.

**Tavern**. For the law of Ts. *see* INNS AND INNKEEPERS; LICENCES AND LICENSING LAW.

**Tavernier, Jean Baptiste, Baron D'Aubonne** (1605-89), Fr. traveller, b. in Paris of Protestant parents, and commenced his career as a traveller in 1631, when he went to Turkey and Persia. During succeeding years he travelled much in the E., visiting many places in Persia, Syria, and India. Finally he travelled through Batavia, and returned via the Cape. He pub. his famous *Six Voyages* in 1676. *See* study by Foret, 1886.

**Tavilah**, *see* KISHM.

**Tavistock**, mkt. tn. and urb. dist. of Devonshire, England, 15 m. N. of Plymouth, on the R. Tavy. It forms one of the gateways to Dartmoor. It is connected with the Tamar by canal. Known as the 'Gothic Town of the West' it has sev. fine buildings, chief amongst which are the par. church of St. Eustachius (fourteenth century), and the guildhall. There are also the remains of an abbey, founded in the tenth century, which was granted to the Russell family at the time of the Dissolution by Henry VIII. Part of this now constitutes a public library. T. is an agric. centre. The dist. around T. contains a number of fine Tudor manor-houses. T. forms part of a co. constituency. Pop. 6100.

**Taxation**, term applied to the method of raising the revenue required for public services through compulsory levies.

**General Principles of Taxation**.—There are two schools of thought as to the purpose of T. The older school, basing itself on Adam Smith and Ricardo, and flourishing during the free-trade era of the

nineteenth century, believed that T. should be designed solely to raise the revenue required by the expenditure authorised in the Budget. The newer school thinks that T. should also be used to promote social justice and equality. This was first taught in Germany by Adolf Wagner towards the end of the last century; but later this doctrine was generally accepted. In Britain, Lloyd George was the first to use T. as an instrument of social reform. The two wars, with the necessity for raising higher revenue and need for 'equality of sacrifice' by the whole pop. left no other choice but to design T. in conformity with the prevailing ideas of social equality. The Second World War especially brought a redistribution of incomes and through income tax and surtax extinguished very high incomes considered as unsocial. With the increase of public expenditure (and the consequent need for permanent high T.), a third aim of T. became generally accepted. It is now also used as an instrument of general economic policy in order to contribute to general stability (in addition to the traditional means of monetary policy) or to achieve specific aims. Examples are maintenance of high rates of income tax at periods when inflation is threatened and levy of higher rates of purchase tax on goods which would be particularly suitable for exports.

In addition to these general principles of T., economists are still discussing the four canons or maxims set out by Adam Smith on the standards by which the quality of a tax should be judged. These maxims are (1) Equality. The subjects of the State should contribute to the support of the State as nearly as possible according to their ability. (2) Certainty, not arbitrariness. (3) Convenience of payment. (4) Economy of collection. It is clear that these principles cannot always be realised and are incomplete in the light of present conditions; but there have been no generally accepted canons evolved by the modern theory of public finance.

**Classification of Taxation**.—Taxes can be classified according to a number of different principles, *e.g.*, the tax base (land tax, income tax, etc.), the media of payment (money, payment in kind, payment in labour—the last two of no significance in modern times), the regularity of levy (income tax to be paid annually, special contribution from capital only once). The distinction of direct and indirect taxes is based on the assumptions regarding shifting, as Mills says: 'A direct tax is one which is demanded from the very persons who it is intended or desired should pay it. Indirect are those which are demanded from one person in the expectation and intention that he shall indemnify himself at the expense of another, such as excise or customs.' In some cases, the classification is arbitrary, and relates in practice rather to the method of collection than to incidence.

A second problem, which occupies the theory of T., is that of *shifting* and



*incidence.* It is clear that if the gov. collects a tax on cigarettes from the manufacturer, the amount of the tax is passed on to the consumer in the price of the cigarettes. This transfer of the burden of the tax from the original payer to someone else is called *shifting*. This may take place from the original payer to someone else only once (e.g. the rates from the landlord to the tenant of a dwelling), or through a whole chain of economic relationships (from the tobacco manufacturer to the wholesaler to the retailer to the consumer). *Incidence* of the tax is on that group which cannot shift it any further. Taxes which are levied on large classes of the pop., e.g., income tax, cannot be shifted.

A further problem is the economic effect of T. Too high profit and income tax may act as a discouragement to enterprise. Too high rates of income tax on wages or a sudden steep rise after a certain amount of income may act as a discouragement to the worker, who does not feel it worth while to work overtime if he has to pay to the state a large part of his additional earnings.

Licence revenue obtained as the result of an ann. tax on the right to use a certain commodity (e.g. a wireless receiving set) may be classed as a direct tax, whereas a tax on enjoyment or consumption may be classed as indirect if the impact and incidence fall on different parties. Taxes such as the Brit. entertainment tax imposed in 1916 or the purchase tax on certain articles imposed in 1910 fall in this second class, but there is no distinction in kind between a periodical tax on the continued enjoyment of a commodity while it remains in use and a tax on its enjoyment in the form of a once-for-all tax paid at the time of its purchase. Modern economists therefore make a truer distinction between (1) income and capital taxes on the one hand and (2) outlay taxes on the other. T. in the first category includes (1) taxes on net incomes which are progressive as they allow liability to be adjusted in accordance with ability to pay; (2) taxes on profits, and (3) capital taxes, strictly a levy on capital, but estate and succession duties are also included under this head. The second category—outlay taxes—includes taxes on commodities. An outlay tax is a tax on consumption assessed either on the value of the commodity or in the form of a licence. When assessed on the value of the goods, the tax is either *ad valorem*, i.e. related to the selling price, or specific, i.e. reckoned in accordance with quantity. Outlay taxes in the United Kingdom are generally specific in character. The 'property tax' or tax on the ownership of real estate, although allied to income tax, is strictly an outlay tax, and similarly when assessed on the occupier or tenant in the form of rates, the tax is analogous to the licence for the use of a commodity.

According to a calculation made by the Economic Co-operation Administration Mission to the United Kingdom, the total tax burden rose by 235 per cent in the United Kingdom, and by 290 per cent in

the U.S.A. from 1938 to 1948. Total T. accounted for 26 per cent of the national income in Britain and for 19 per cent in the U.S.A. in 1938; in 1948 the proportion was 43 per cent in the United Kingdom and 27 per cent in the U.S.A.

See A. C. Pigou, *A Study in Public Finance*, 1928; H. A. Silverman, *Taxation, its Incidence and Effects*, 1931; G. Armistage-Smith, *Principles and Methods of Taxation*, 11th ed. 1935; G. Findlay Shirras and L. Rostas, *The Burden of British Taxation*, 1942; and U. K. Hicks, *Public Finance*, 1947.

See also CUSTOMS; DEATH DUTIES; EXCISE DUTY; INCOME TAX; LAND TAXES; LOCAL TAXATION GRANTS; PUBLIC REVENUE; RATES AND RATING.

**Taxation Grants, Local**, see under LOCAL GOVERNMENT.

**Taxation of Costs**, see COSTS.

**Taxation of Land Values**, see LAND TAXES.

**Taxicab**, see under CAB.

**Taxidermy**, art of preparing the skins of vertebrate animals so as to give them the appearance of life and preserve their characteristics as nearly as possible. The art began to be practised in the sixteenth century, and the Sloane collection, which formed the nucleus of the natural hist. collection at St. Kensington, was made in the early eighteenth century.

**Taxing Master**, see COSTS.

**Taxus**, see YEW.

**Tay**, riv. and firth of Scotland. It rises on the borders of Argyllshire in the Grampians, and flows first of all in a N.E. direction and then at the confluence of the Tummel in a S.E. direction. It flows through Perthshire and its estuary forms the div. between the cos. of Forfar and Fife. Its chief tribs. are the Tummel, the Bran, the Almond, and the Earn. The Earn joins it at its estuary. The total length of the riv., including the firth, is 115 m. It is crossed at Dundee by the famous T. Bridge. Part of the first bridge, opened in 1878, was blown, together with a train passing over it, into the riv. in 1879. The present T. Bridge was completed in 1887. The chief port is Dundee, but shoals prevent navigation to this port being very good. The riv., however, is navigable as far as the tn. of Perth. The total area of the T. basin is nearly 2500 sq. m. It is famous as Scotland's most important salmon riv.

**Tay, Loch**, one of the lochs which are found in the course of the R. Tay. It is situated in Perthshire, not very far from the source of the riv. and before the riv. joins the Tummel. There is good fishing in the loch.

**Taylor, Jeremy** (1613-67), Eng. divine, b. at Cambridge and educated at Gonville and Caius College, Cambridge, and Univ. College, Oxford. He took holy orders in 1634. His sermons attracted the attention of Laud, who interested himself in T., and sent him to Oxford, where he was elected to a fellowship at All Souls in 1636. He became chaplain to Laud and shortly afterwards was appointed one of the king's chaplains. In 1643 he was made rector of Overstone, and two years later was

taken prisoner by the Parliamentary forces at Cardigan Castle. He settled at Gordon Grove, Carmarthenshire, and wrote his well-known works, *The Liberty of Prophesying* (1646), a noble and comprehensive plea for toleration; *The Rule and Exercises of Holy Living* (1650); and *The Rule and Exercises of Holy Dying* (1651). His more formal treatises include *An Apology for Authorised and Set Forms of Liturgy* (1646); *The Worthy Communicant* (1660); *The Rite of Confirmation* (1663); and *Ductor Dubitantium, or the Rule of Conscience* (1660), the subtlest of his works, and intended as a handbook of Christian ethic. After the Restoration he was appointed bishop of Down and Connor and made vice-chancellor of Dublin Univ., and was also made 'administrator' of the diocese of Dromore; but his desire for an Eng. bishopric was never gratified, though his claims for such preferment were incontestable. T. was also appointed a member of the Irish Privy Council. His tenure of the Irish bishopric was apparently unhappy: T.'s strict episcopalianism and extremely High Church views made him unpopular among his clergy and his Irish Protestant congregations. T. was one of the most literary of churchmen, and his books are still regarded as among the masterpieces of theological literature. His prose style had a nobility and passion which invites comparison with that of Bossuet. He was a brilliant scholar of the late Renaissance period, but his writing is distinguished not only by its logic, but by its imagination, purity, and complete sincerity. His works were first collected by Bishop Reginald Heber in 1822 and these were revised by C. P. Eden (1847-52). The *Poems and Verse Translations* were edited by A. B. Grosart (1870). See lives by T. S. Hughes, 1831; E. Gosse, 1904; and W. J. Brown, 1925.

**Taylor, Zachary** (1784-1850), twelfth President of the U.S.A., b. in Orange co., Virginia. He entered the army in 1808, and distinguished himself in sev. engagements against the Indians. After the annexation of Texas he resisted the Mexican invasion, winning the battles of Palo Alto and Resaca de la Palma and seizing Matamoros and Monterey, and later gained the memorable victory over Santa Anna at Buena Vista in 1847. On his return he was elected President (1848) as a Whig, just at the time when the struggle over the extension of slavery had begun, but he died during the compromise of 1850. Though a Southerner and slave owner, he declared in favour of the admission of California as a state where slavery would be forbidden.

**Tayport, or Ferry-Port-on-Craig**, tn. in the co. of Fife, Scotland, on the shore of the frith of Tay, 3½ m. E.S.E. of Dundee. It has foundries, engine works, and timber yards, and linen and jute are manufactured. Pop. 3400.

**Tbilisi**, see **TIFLIS**.

**Tchad**, see **CHAD, LAKE**.

**Tchalkovsky, Peter Ilyich**, see **TSCHAIKOVSKY**.

**Tchanak-Kalessia**, see **KALE-T-SUL-TANAH**.

**Tcheke, see under G.P.U.**

**Tchekov, or Chekhov, Anton** (1860-1904), Russian novelist, short-story writer, and dramatist, b. at Taganrog. He came of peasant stock. His father was a clerk and later a shopkeeper at Taganrog. T. was brought up in an atmosphere of dismal religious strictness which resulted in his having no religion later, though the discipline inspired in him his characteristic knowledge of and sensitiveness to the Russian language. Educated first at a par. school and then at a grammar school, he developed into a lively, witty youth, the life and soul of his schoolfellows, even then writing farces. At the age of sixteen he began to earn his living as a tutor, and then went to Moscow Univ. as a medical student, where very soon he began literary hackwork to keep his father's family from starvation. In 1882 he wrote humorous articles for a paper called *Fragments*, meeting with no success with serious efforts. Ten years later he set up as a doctor near Voskressensk, his experiences in that capacity serving later as a theme for much of his work, especially *The Three Sisters*. His stories *A Horselike Name* and *Huntsman in the St. Petersburg Gazette* attracted the notice of literary celebrities and secured for him an opening in the *Noroye Vremya*, where his work took on a serious turn. His fame began to spread. In 1888 *The Steppe* appeared in *Severny Vestnik*, the leading magazine, and soon after his *In Twilight* and *Gloomy People* brought him the Pushkin prize. Generally, however, impecunious, he worked harder than ever, his health broke down, and he developed signs of consumption. This notwithstanding, he now began writing plays, his first, *Ivanov*, appearing with success in 1887; this was followed by *The Wood Demon*, later produced at Moscow as *Uncle Fanya*. This latter play was not successful, and apart from vaudevilles he wrote no more plays for some years. In 1890-91 he went to Sakhalin for his health, returning to Melikhovo for medical practice. In the next few years appeared his best stories: *The House with the Mezzanine*; *The Black Monk*; *Murder*; and *Mouchiks*, etc. Many of these concern peasant life, which, contrary to convention, he handled realistically, and it is from this type of his stories that a vast Russian literature has arisen. He resumed playwriting in 1895 with *The Seagull*, produced at St. Petersburg. In 1900 T. was elected a member of the Academy of Sciences. In 1904 was performed *The Cherry Orchard*, his most famous play. In this year his health so declined that he again went abroad, dying in Germany, his body being removed to Moscow for burial. T.'s interpretation of modern culture has been compared not inaptly with the religion of H. G. Wells, for he also has it that God is the spirit in the world, that, like transcendental imagination, contrives to make good use of opportunities offered by ever-changing nature. He manifested an increasing interest in subjects of the social order in

his works, as in *The Fil* (the problem of prostitution) and in his peasant studies; but he never posed political problems. Among his other works are *My Life*, a long story with scenes from Taganrog (1896), and *The Duel* (1891). His influence on the form of modern drama and the short story is incalculable. He made both the setting for the release and analysis of emotion: through a nondescript Russian prov. family he attempted to portray universal aspirations and emotions. This aspect of T. has had lasting effect upon Eng. and Fr. literature: traces of his influence are especially apparent in the work of Lawrence, Katherine Mansfield, and Elizabeth Bowen. In his own country his vivid impressions of bourgeois and peasant 'futilities' were to have social repercussions; Gorky acknowledged his debt to T.'s realism, but his literary influence in Russia has been less direct than in W. Europe. See W. Gerhardt, *Anton Chekhov: A Critical Study*, 1923; L. S. Friedland (ed.), *Letters on the Short Story, the Drama, and other Literary Topics by Anton Chekhov*, 1924; S. S. Kotchansky and P. Tomlinson (trans. and ed.), *The Life and Letters of Anton Tchekhov* (bibliography), 1925; M. Gorky, *Reminiscences of Tolstoy, Chekhov, and Andreyev*, 1934; Nina A. Tommanova, *Anton Chekhov: the Voice of Twilight Russia*, 1937; K. Chukovsky, *Chekhov the Man*, 1945; and W. H. Bruford, *Chekhov and his Russia: A Sociological Study*, 1948.

**Tchelyabinsk**, see CHELYABINSK.

**Tcherkesses**, see CIRCASSIA.

**Tchernigov**, see CHERNIHOV.

**Tchimbend**, see CHIMKENT.

**Tchirpan**, see CIRPAN.

**Tchistopol**, see CHISTOPOL.

**Tchitcherin**, see CHICHERIN.

**Tchorlu**, see CHORLU.

**Tchuwashes**, see CHUVASHES.

**Tea**, beverage used since a remote period in China, but unknown in England until 1657. Though it at once attracted great interest it was obtainable only by wealthy people until about 1750. At first it was infused and kept in barrels, being drawn like beer, and warmed for use. In 1660 a tax of 1s. 6d. was imposed per gallon of liquid tea, but in 1680 a tax of 5s. per lb. was substituted. Since 1852, when the tax was 2s. 2½d. per lb., it has been down to 4d. in 1890, and was 5d. just before the First World War. In 1929 the duty of 4d. on foreign and of 3½d. on empire T., was repealed. The duty was reimposed in April 1932, the rates for foreign and empire teas being 4d. and 2d. respectively. These have since been altered from time to time. Consumption in Britain in 1949 was just over 400,000,000 lb., or just under 9 lb. per head of the pop.; of this about two-thirds is Indian T. The first shipment of Indian T. was made from Assam in 1839. T. is derived from *Camellia sinensis*, which is indigenous to Assam and China. The young leaves and shoots (the 'flush') are picked from the bushes by women. After gathering they are taken to the factory, spread thinly over wire or bamboo trays, and placed on wire or hessian racks to wither, after which

they can be rolled without breaking. The length of time required for withering depends on climatic conditions, the shortest time being about twelve hours, and the average, twenty-four hours. During the wet seasons, and in specially humid areas, the leaves are withered by artificial heat. The next process, that of rolling, is done entirely by machine so far as general commercial production is concerned. It causes the juice to be exuded, and it imparts to the leaf the twist characteristic of its manufactured state. The leaf is then spread out thinly in the fermenting room, where the air is kept moist, and there in a few hours it changes from green to copper colour. It is then 'fired' by being spread on trays which pass through a hot-air chamber. After being sorted or classified, a process carried on in modern factories by machinery, the T. is then packed for export.

In making T. the water should be fresh and freshly boiled, and after pouring over the T., should be allowed to stand for three to five min., when the T. should be poured off the leaves. More than half the T. exported from T.-producing countries is consumed in Great Britain and N. Ireland. In relation to imports the next largest consumers—outside the producing countries—are the U.S.A., Australia, and Canada. After the outbreak of the First World War, internal troubles and national poverty greatly changed the ability of Russia to purchase this beverage, but in theory, at all events, Russia remains one of the great T.-drinking nations. During recent years T. has gained increased popularity in the U.S.A. Until the beginning of the Second World War, London was the chief T. market of the world, and the prices at the London sale-rooms estab. values in every country, with the possible exception of China. This results from the fact that Chinese T. is marketed in a different way from the T. of other lands, the purchases being usually made in China on behalf of importers instead of the T. being exported to London and elsewhere for sale by auction. But even in the case of China, prices were largely influenced by results in the London sale-rooms. The Eng. T. trade was, however, temporarily disrupted by the impact of war. T.-producing areas of the world are India and Pakistan, Ceylon, Indonesia, and E. Africa. There are over 840,000 ac. of T. in India and Pakistan, and in 1950 their production was about 600,000,000 lb., with exports of more than 350,000,000 lb. Ceylon, the next most important T.-growing area, has over 550,000 ac. under cultivation, and exports for 1950 were about 300,000,000 lb., of which about one-third reached the United Kingdom. Before Japan's occupation of Indonesia in 1942, Sumatra and Java had some 500,000 ac. under cultivation, with an ann. production of about 160,000,000 lb. of T. In E. Africa the prin. T. growing countries are Nyasaland, Kenya, Uganda, and Tanganyika. They grow over 50,000 ac. of T. with an output of 30,000,000 lb. per year. India, Ceylon, and Indonesia gradually

supplanted China as the world's chief source of T., and by 1939, together with E. Africa, they supplied some 83 per cent of the world's T., while China supplied less than 10 per cent. To regulate the exports of T. from these four T.-producing areas, the International Tea Agreement was signed in April 1933, and it was renewed in 1938. Japan and Formosa have endeavoured to increase their trade in T. during recent years, and by the outbreak of the Second World War they were exporting nearly 66,000,000 lb. of T. per annum. T. trade has always interested the Brit. merchant and investor, and many of the best tea gardens of the E., particularly in India and Ceylon, are controlled by Brit. companies. Much also of the continental T. trade is Brit. For maté or Paraguay T., see MATÉ. See O. Lancaster, *The Story of Tea* (new ed.), 1947, and R. D. Morrison, *Tea—Its Production and Marketing* (revised), 1948; and *Tea: a Progressive Industry*, 1950. all pub. by the Tea Centre.

#### Teaching, see under EDUCATION.

**Teak**, Asiatic timber tree growing in various countries, though the wood is provided chiefly by the true teak, *Tectona grandis*, a species of the family Verbenaceae. It reaches a great height and bears panicles of small white flowers. The wood is deep yellow to dark brown or almost black, in colour. Its primary use is in shipbuilding, where the essential oil contained in it has the desirable quality of non-corrosion of the metal fittings, the metal decks on which it lies, and the bolts that stay it down.

**Teal** (*Querquedula crecca*), kinds of small fresh-water duck. The male, in general colour, is dusky grey; tail-feathers ashy grey; crown of head deep cinnamon or chestnut; the eye is surrounded by a black band, glossed with green or purple, which unites on the nape; wing markings black and white; bill black and resembling that of the widgeon. Total length 14–15 in.

**Teallach**, An, picturesque and dominating twin-peaked mt. in W. Ross, Scotland, giving its name to range rising on S. side of Little Loch Broom. Bidean a' Ghlas Thuill, 3483 ft. is the higher. 'A.T.' means 'The Forge' because of the smoke-like mists around its peaks.

**Tea**, Paraguay, see MATÉ.

**Tea Rose**, see under ROSE.

**Tears**, secretion of the lachrymal gland. See also EYE.

**Teasel**, or **Teazel** (*Dipsacus sylvestris*), common Brit. biennial herbs of the order Dipsacaceae, found on roadsides and under hedges. In the first year it forms a large rosette, flat upon the ground, of oblong, lance-shaped leaves, with prickly mid-ribs. The flower stems in the second year reach a height of 5 or 6 ft. They are rough and spiny, and have cylindrical flower-heads of small tubular purple flowers.

**Thébessa** (anct. Theveste), tn in Algiers, in the dept. of Constantine, famous for its Rom. ruins.

**Tebeth** (Esther ii. 16), tenth month of the Jewish calendar (or fourth month from Tishri (q.v.), corresponding to Dec.-Jan.

**Technical Education**, system of instruction the aim of which is directly utilitarian, especially in relation to productive industries. In the wider sense of the term, any branch of knowledge which is a necessary preliminary to any particular profession or trade is technical, such as the instruction received by medical students, law in connection with the legal profession, the principles of art as studied by artists with a view to their application, etc. For administrative purposes, however, the term is practically restricted to instruction in industrial and commercial processes, art and handicrafts, etc. It is directed towards those wishing to enter industry or commerce, and as such embraces every aspect of industrial organisation, as well as including specialised training in certain trades, e.g. engineering. See further under EDUCATION, *Technical Education*; IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

**Technicolor**, leading colour process employed in modern cinematography. The first T. films were made about 1926: a special lens and filters were used to obtain a two-colour image, which was based upon the principles known as the additive process. This was later abandoned when the two-colour subtractive process was introduced, which was followed by the three-colour subtractive process, the system now employed. The T. three-colour camera photographs the three primary aspects of a scene (red, green, and blue) upon three separate film strips, simultaneously, at normal speed, without fringe or parallax, in balance, and in proper register with each other. These separate strips are developed to negatives of equal contrast and are always considered and handled as a group. From these colour-separation negatives, printing is carried out by projection through the celluloid upon a specially prepared stock, which is then developed and processed to produce positive relief images in hardened gelatin. These three reliefs are then used as printing matrices which absorb dye. The dye is then transferred by imbibition printing to another film strip which, when it has received all three transfers, becomes the completed print ready for projection. This process is designed to reproduce whatever is placed in front of the camera, not only as to colour, but also as to light and shade.

The T. process reproduces a full scale of contrasts and effects of light and shade, and consequently the designer of settings has to bear in mind the cameraman's problem of achieving the necessary light-levels with a minimum number of sources of illumination. T. adds few complications to sound recording, but the 'whistle' from the arcs caused by high-frequency ripples in the electric current coming from the commutators of direct-current generators must be eliminated. This is done by the combination of an alternating-current filter at the generator and additional choke-coils at the individual arc units. Modern film production, Amer. and Brit., has proved that used imaginatively, colour heightens dramatic effect.

Some experts believe that T. will eventually supersede black-and-white photography altogether in film-making.

**Technology, Imperial College of Science and, see IMPERIAL COLLEGE.**

**Tedder, Arthur William**, first Baron of Glengau (b. 1890). Brit. airman, educated at Whitgift School and Magdalene College, Cambridge. He entered the colonial service in 1914. Commissioned in 1914 in the Dorset Regiment, he went to France in 1914 and was seconded to the Royal Flying Corps in 1916. He was given a permanent commission in the R.A.F. in 1919. He held sev. important posts and became air officer, commanding-in-chief Middle East, 1941-1943. He became vice-chief of the air staff, and air commander-in-chief, Mediterranean air command in 1943. T., appointed deputy supreme commander under Gen. Eisenhower for the Anglo-Amer. expeditionary force, was the first Brit. airman to assume so important a military post. He was a specialist in strategy, moulding to his own shape the current ideas on air co-operation with armies. He relinquished the post of chief of the air staff at the end of 1949 at his own request in order to facilitate the advancement of younger officers. T. was promoted marshal of the R.A.F. in 1945. He was knighted in 1942 and created a peer in 1945.

**Teddington**, tn. of Middlesex, England, on the L. b. of the R. Thames, forming, since 1937, part of the bor. of Twickenham for municipal purposes. The records of the tn. go back to Saxon times, when it was associated with the Benedictine monastery at Staines. The manor of T., with this monastery, was granted by King Edgar to the abbot and monastery of Westminster. The National Physical Laboratory, is situated in T., overlooking the park in Queen's Road. Close by is the Chemical Research Laboratory. T. is the highest tidal point on the riv., and its famous lock is also the largest on the Thames, 650 ft. long by 25 ft. wide. T. is the point where the discharge is gauged. Pop. 24,000.

**Te Deum Laudamus**, well-known non-metrical Lat. hymn, found in the Rom. breviary at the end of Matins, and also used by the Rom. Catholic Church on occasions of rejoicing. There has been much discussion on its origin, and modern scholars have shown that it consists largely of borrowings from older sources. Its present form is probably due to Niceta, bishop of Remesiana (d. c. 414). There are twenty to thirty Eng. versions, including one by Dryden.

**Tees**, riv. of England, which rises in Cross Fell, Cumberland and flows S.E. and then N.E. through Teesdale, forming the boundary between Yorkshire and Durham. After a course of 70 m. it flows into the North Sea.

**Teeth**, calcareous structures occupying the alveolar processes of the upper and lower jaw, and serving to tear, cut, or grind food.

In man there are thirty-two permanent T., sixteen in each jaw. They are divided

as follows: two incisors, one canine, two premolars or bicuspid, and three molars in each lateral half of each jaw. The incisors have chisel-shaped crowns, and are therefore adapted for dividing food by cutting. In the upper jaw they are socketed in the pre-maxillary bone. The canine T. are conical in shape, and are therefore adapted for piercing. In carnivorous animals they are developed as sharply pointed T., which serve to tear the prey. The canines are borne behind the junction of the maxillary and pre-maxillary bones. The premolars have somewhat flattened crowns and bear two cusps, one external and one internal. The first premolar has sometimes two roots, though, like the canines and incisors, it usually has a single root. The molars, the largest and finest T., are placed behind the bicuspid. Those of the upper jaw have three or four cusps, while the lower-jaw molars have four or five. The upper molars have usually three roots each, and the lower molars two roots each. The last and smallest molar is known as the 'wisdom tooth.' The arrangement of the T. of any mammalian species is best summed up in a dental formula. Thus the formula for

man, 2.1.2.3. indicates that there are 2

incisors, 1 canine, 2 premolars, and 3 molars in each lateral half of the upper and of the lower jaw. In man the structure of all the T. is essentially the same. The outer layer is composed of enamel, a hard substance consisting principally of calcium phosphate and smaller amounts of calcium carbonate, magnesium phosphate, and calcium fluoride. The next layer is composed of dentine which contains the same mineral substances as the enamel with the addition of organic matter. Dentine is hard, though not so hard as enamel; it forms the greater part of the bulk of the tooth, and is furnished with a series of fine channels by which communication is estab. between its substance, the enamel and the dental pulp. The dental pulp is contained in a cavity within the dentine. It consists of blood-vessels and nervous matter. The root of the tooth is devoid of enamel, but possesses a coating of 'dental cement,' a bony layer which is adjacent to the periosteum of the alveolar cavity. The permanent T. in man are preceded by temporary or 'milk' T. These are fewer in number, smaller in size, and whiter in colour than the permanent T., and they are also somewhat different in shape, the roots of the molars, in particular, being more divergent than corresponding structures in permanent T. The process of their development is usually over by the end of the second year. The permanent T. develop from the fifth year to the twentieth year.

Dental caries is a common disease affecting the human race. The cause of the disease is the presence of bacteria in the mouth which bring about fermentative changes in starchy or carbohydrate food by which lactic acid is produced. The acid disintegrates the enamel coating,

after which other bacteria cause putrefactive changes in the organic matter of the dentine, leading to a breaking down of the tooth structure, inflammation of the pulp, and the consequent distressing pain known as toothache. The baneful effects upon general health resulting from defective T. can be successfully obviated only by recourse to the methods of dental surgery. Pyorrhoea (*q.v.*) also has markedly ill effects on general health. T. should be cleaned before retiring, on rising, and after every meal, by brushing up and down, and to and fro.

**Dentistry.**—This is the dept. of medical science which treats of the care of the mouth, particularly of the T. The work that falls to the dentist is mainly comprised under the heads of dental surgery, mechanical dentistry, and dental prophylaxis, or the general prevention of T. diseases. Dental surgery includes all measures for the treatment of unsound T. and the correction of deformities and irregularities of the T.; mechanical dentistry deals with the manuf. and adjustment of artificial substitutes for T.; while the dentist is also often called upon to treat neuralgic pains associated with the T., and to inspect and cleanse T. as a routine precautionary measure. The art of dentistry has been practised from very early times. In the nineteenth century much progress in dental science is particularly associated with the names of Blake, Fox, and Bell in England; Fonzi, Cuvier, and Bertin in France; and many able scientists and practitioners in America. In 1878 the profession was regularised in England by an Act which estab. a register, the conditions for registration being put in the hands of the General Medical Council. The position was further regularised by the Act of 1921, according to which all persons practising dentistry have to be registered, the penalty for an unregistered person practising being a fine not exceeding £100. The term dental surgeon is strictly reserved to those who possess the qualification of L.D.S. or are otherwise professionally qualified. Registration is still supervised by the General Medical Council. The licensing corporations are the Royal Colleges of Surgeons in England, Scotland, and Ireland, and the Royal Faculty of Physicians and Surgeons of Glasgow.

Common dental faults are misplaced or diseased T. Where the tooth has been actually attacked by decay, filling aims at arresting this and repairing the structure by filling or stopping. Extraction has been rendered safer by the introduction of new instruments and the increased knowledge of the anatomical relationships of the T. Extractions are rendered painless by the use of suitable anaesthetics.

In the fitting of artificial T., single T. are sometimes fitted on old stumps, or are fixed to neighbouring sound T. by metal fastenings. Where a number of T. have to be supplied the dentist first makes a mould of the jaw and palate by fitting wax closely over it. From this a plaster model is made, from which two metallic

dies are prepared, one made to fit into the other. A thin gold plate is then swaged between the male and female dies to the exact shape of the palate. To this base-plate porcelain T. are fitted by means of platinum pins baked into the T. and fused to gold stay-pieces, which in turn are fused to the base-plate. Where it is impossible to arrange for the support of the plate by fitting it to sound T., a vacuum chamber is made in the base-plate, which is exhausted by the wearer and serves to make the plate adhere to the palate. In cases where most or all of the T. have to be extracted before the artificial T. are made a mould of both jaws is taken. By this means the set may be prepared in exactly the same shape as the natural T.

**Teheran, or Tehran,** city and cap. of Persia, and cap. of a prov. of the same name. It stands in the centre of an exceedingly fertile plain about 60 m. S. of the Caspian Sea. The climate is extremely hot during the summer, but mild and pleasant during the rest of the year. The old city is typically eastern, surrounded by pleasant and well-kept gardens. Inside the ark, or citadel, is the old royal palace, and there are numerous mosques, in one of which Shah Nasr-od-Din was assassinated in 1896. Old T. is surrounded by a bastioned wall. Under Shah Reza Pahlevi (1921–41) T. was to some extent rebuilt and extended on W. lines. It is a commercial centre, and has match, tobacco, textile, cement, machinery, and munitions manufs., and large sugar refineries. A new royal palace was erected to the N.W. during his reign, and a univ. founded (1935). There are sev. secondary schools and a number of museums. T. became cap. of Persia, in place of Isfahan, in the eighteenth century. Pop. (city and suburbs) 699,000.

**Tehri-Garhwal,** see *UNDER GARHWAL*.

**Tehuantepec,** tn. of Mexico, in Oaxaca State, on the R. Tehuantepec, 13 m. from Salina Cruz on the S. coast. Pop. 12,000.

**Tehuantepec Winds, or Papagayos,** strong cold winds due to the same influence as the 'nortes' or 'northerlies' of the regions round the gulf of Mexico. They are cold, dry winds from the continent, allied to the mistral or bora of the Mediterranean. They are strong on the Mexican W. coast, but weaker on the Pacific, in Nicaragua and Guatemala, where they are known as T. W. from their direction.

**Teignmouth, John Shore,** first Baron (1751–1834), Brit. statesman. He entered the service of the East India Company as a cadet at the age of eighteen. He rose rapidly and was finally made a member of the Supreme Council. In 1793 he succeeded Cornwallis as governor-general of India. He retired from this office in 1797 and received his peerage on his return to England.

**Teignmouth,** seaport and mkt. tn., urb. dist., and holiday resort of Devonshire, England, situated at the mouth of the Teign, 15 m. S.E. of Exeter, on the Tiverton parl. div. of Devon. Its seawall is 2 m. in length. It is built partly on a tongue of land between the Teign

and the sea, and partly on rising wooded ground enclosing the valley which rises to the high moors below Haytor. Pipe-clay and china clay are shipped here for the Staffordshire potteries, and fishing is carried on, salmon, whiting, and mackerel being taken from the Teign. Salt was formerly an important industry. Pop. 11,000.

**Teinds.** The T. of a Scottish par. like the tithes of Eng. law, are that proportion of rents or goods which goes to the maintenance of the clergy. The clergy, however, have now no right to T. beyond a suitable provision or stipend.

**Tejuco,** *see* DIAMANTINA.

**Tekir Dag,** *see* under ROPOSTO.

**Tel al-Amarna** or **Tell el-Amarna**, site of Akhetaton, cap. of Akhnaton (*q.v.*), is situated about 170 m. S. of Cairo, on the E. bank of the Nile. In the limestone cliffs surrounding the plain of T. al-A., are cut a series of tombs of Akhnaton's nobles. Inscriptions in them contain the beautiful hymns of the Aton faith; there are also lovely natural designs of animals, birds, reeds, and plants. A group of clay tablets found accidentally in the winter of 1887-88 at T. al-A. by an Egyptian peasant woman (who sold her rights in the discovery for about 3s.) opened an entirely unknown vista in the hist. of Palestine and the surrounding countries. Most of the tablets are diplomatic communications from Egyptian vassal kings in Palestine and Syria to their lord the Pharaoh, Amenhotep III., and Amenhotep IV. (Akhnaton). About 150 of the T. al-A. letters were written from Palestine, some by Abdi-Hiba, king of Jerusalem, giving us a glimpse of that city more than 350 years before David; some 200 other tablets were written elsewhere, mostly in Syria and Phœnicia. They are in Babylonian language and cuneiform characters.

**Tel-Aviv**, tn. of Israel, situated N. of Jaffa. Although the largest tn., as far as the number of inhab. is concerned, its area before the Second World War was smaller than that of Jerusalem or Haifa. During the war and under the Israeli Gov. the municipal boundaries were extended, so that the area is now some 10,000 sq. ac., four times as great as in 1939. For this area, the pop. goal is 500,000. In 1950 it was proposed to join Jaffa to T.-A. by Act of the Knesset (Parliament) in the near future. The scope of its municipal social and educational services and free medical aid to the poor, etc., were outstanding in Israel in 1950. T.-A. had estab. itself by 1930 as the prin. economic centre of the country. Two large textile factories were erected in 1924, this marked the beginning of steady industrial expansion in T.-A. It became famous for its sugar and chemical and pharmaceutical industries. The largest number of banks are situated here, as well as most commercial firms, newspaper offices, etc. T.-A. is also a cultural centre. All the Heb. daily newspapers are pub. in T.-A., as well as numerous periodicals. It contains the two best-known Jewish theatres. Other municipal buildings include a museum and an art gallery. Its main exports before 1939 were oranges. T.-A. presents, in its

European modernity of style and life, a striking contrast to the Oriental character of Jaffa. The Palestine Electric Corporation has built a power-house at T.-A., and the transmission lines have been extended beyond the tn. boundaries to colonies N., S., and E., and thus provide energy for lighting, industry, water supply, and irrigation.

T.-A. was founded in 1909 by a group of residents of Jaffa, who decided to build for themselves a modern garden-suburb on the N. outskirts of Jaffa, and in 1910 this received its present name which means 'The Hill of Spring.' By 1914 the pop. of T.-A. was 1500, or one-fifth of the total Jewish pop. of Palestine. In addition to the constant migration of Jews from Jaffa to T.-A., the waves of Jewish immigration into Palestine, largely absorbed by T.-A., contributed to a rapid and constant increase of its pop. By May 1921, it was given the status of an independent township gov., and after the disturbances of 1929, the last official links binding T.-A. subordinately to Jaffa were removed. No other place in Palestine has seen so rapid a development. The original quiet streets, with the first sixty small villas, soon developed into broad and busy streets, lined with large modern concrete buildings. By the outbreak of the disturbances of 1936 T.-A. had become the largest tn. of Palestine, and its industrial and commercial centre. As a result of the disturbances the business community could not use the port facilities of Jaffa, and this led to the building of the T.-A. Lighter Port, which made a substantial contribution to its economic expansion. The municipality of T.-A. in 1950, with gov. approval, planned to expand this into a large permanent port. In 1948 T.-A. was made the provisional cap. of Israel. Pop. 250,000 (with Jaffa, 300,000).

**Tel Basta,** *see* BUBASTIS.

**Telecommunications**, name given to the science of communication by electrical means. It embraces such methods of communication as telephony (*q.v.*), whether by line or radio, telegraphy (*q.v.*), including teleprinters or coding systems, and facsimile picture transmission as well as television. *See* RADIO, TELEVISION, etc.

**Telephony**, *see* under HEREDITY.

**Telegraphy**, system for conveying information between two points. The first serviceable telegraphic device, invented by Chappe (France) in 1792, was a form of semaphore. In 1816 Ronald (England) produced his pith ball telegraph, where an electric current to line caused two pith balls to diverge and their movement exposed a character. In 1819 Oersted discovered that the magnetic field produced by an electric current deflected or attracted a neighbouring magnetic needle, the direction of movement depending on the direction of current flow. Cooke and Wheatstone, applying this principle, produced the first practical electric telegraph system in 1837. Their first system was a five-needle telegraph requiring five lines. This was followed by the double-needle

and then the single-needle system. Fig. 1 shows the system in its simplest form. When a message is to be transmitted from A to B, the key is depressed as shown and line current flows through the recorder at B to earth and deflects the

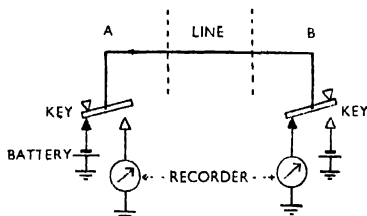


FIG. 1. PRINCIPLE OF COOKE AND WHEATSTONE ELECTRIC TELEGRAPH

recorder needle. Similarly a message may be passed from B to A.

Karl Steinheil was the originator of acoustic and recording T. In 1836 he devised an acoustic telegraph with two gongs of different notes. Line current deflected one of two needles depending on the current direction. Attachments to

code consists of two distinct signals in groups to define the various characters. One signal is a 'dot' and the other a 'dash': the dash being three times the duration of the dot. There are intervals between the letters and a longer interval between words. Fig. 2 shows the Morse code now used. The dot-and-dash movements of the armature of a sounder are read by the ear of the operator, and this sounder principle became popular in all parts of the world. The elementary Morse

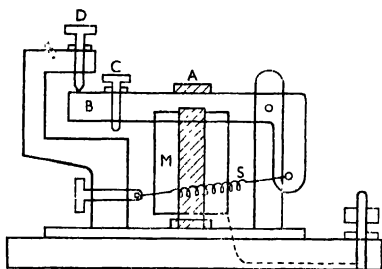


FIG. 3. MORSE SOUNDER

A . —	T —
B . . . .	U . . —
C . . . .	V . . . —
D . . .	W . — —
E .	X — . —
F . . . .	Y — . — —
G — . .	Z — — . .
H . . . .	
I . .	
J . . . . —	1 . . . . —
K . . .	2 . . . . —
L . . . .	3 . . . . —
M — —	4 . . . . —
N — .	5 . . . .
O — — —	6 . . . .
P . . . .	7 . . . .
Q . . . . —	8 . . . .
R . . .	9 . . . .
S . . .	0 . . . . —

FIG. 2. THE MORSE CODE

these needles struck the gongs and thus gave a code of audible signals. Alternatively the needles were equipped with ink-holders in contact with a moving tape and recorded dots in two parallel lines to give the message according to a dot code. In 1837 Morse produced his electro-magnetic telegraph. The Morse

system is much the same as Fig. 1, except that the recorder at each end is replaced by a sounder. The essential features of the Morse sounder are shown in Fig. 3. It consists of a U-shaped electromagnet M and a soft iron bar A attached to a brass bar B. The brass bar B is pivoted so that its free end can move up or down; this end is normally kept up by spring S. When the signal current flows through the electro-magnet, the iron bar A is attracted, the brass bar is pulled down and the screw C strikes the frame. When the

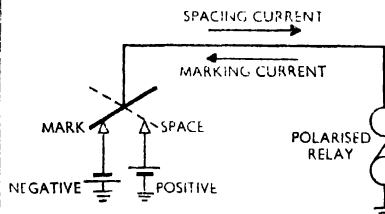


FIG. 4. DOUBLE-CURRENT WORKING

current ceases the spring pulls the bar up again and its end strikes the screw D. The receiving operator hears the two taps; if the interval between them is short the signal is a dot; if long, a dash. Later a number of systems were produced where the dots and dashes were ink recorded on a paper tape. In practice galvanometers are included at each direct sounder station to enable the operator to verify that the key operation is actually causing current to flow to line.

The direct-sounder system can only be used over relatively short lines. On longer lines the sounder is replaced by



a relay which requires a much smaller operating current. The relay contacts complete a local circuit to operate the sounder.

The signalling circuits so far described are single-current working. This method

method is used extensively on long submarine cables. In this use the code (cable code) is similar to the Morse code, except that the dots and dashes are distinguished by direction of current flow and not on a time basis. They appear as punched holes in a paper tape and the two signals are readily distinguished by their relative positions on the tape. This method permits a greater signalling speed.

Double-current working requires a receiving relay of the polarised type, operating in one direction to the mark, and in the reverse direction to the space currents. Polarised relays are much used in T., and Fig. 5 shows a typical modern type used by the Brit. Post Office. The yoke, armature, and pole pieces are made of permalloy. The yoke is in two pieces, clamped together over the end of the armature, the magnetic circuit between the armature and the pole pieces being broken by non-magnetic spacers. The pole pieces are two permalloy screws. The armature contacts play between two contact screws. The relay is polarised by a permanent magnet, the poles of which are in contact with the yoke at the point where the pole pieces pass through it. The coil is wound on a bobbin which is slipped over the armature, but does not touch it. The permanent magnet produces two poles in each half of the yoke, at the pole pieces and at the spacers. The coil magnetises the armature. The paths of the polarising and operating magnetic fields are shown by the solid and dotted lines respectively. These fields aid and oppose each other at the respective pole piece and spacer gaps. With the direction of the fields shown the armature operates to the right (mark position); reversal of the coil current would cause the armature top to move left (space position).

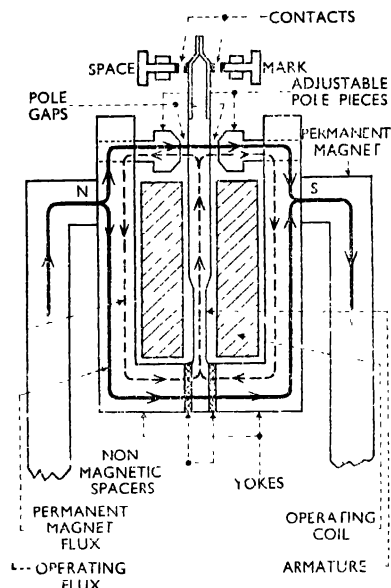


FIG. 5. POLARISED RELAY

involves signal distortion and requires a slow signalling speed to prevent interference between consecutive signals. Double-current working minimises this difficulty. Here the interval between the signal (mark) currents are filled by

The arrangements so far described are simple working, as operation in one direction only is possible at a time. This is sometimes wasteful in the use of the line, and to increase the traffic-carrying capacity of telegraph circuits duplex

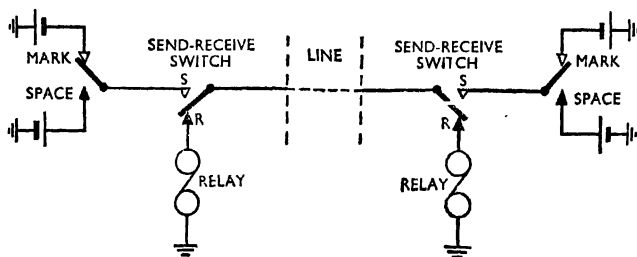


FIG. 6. SIMPLEX WORKING

currents (space) flowing in the reverse direction instead of no current. The effect of the reverse-space current is to accelerate the discharge of the line. Fig. 4 shows the principle, the two batteries having opposite poles to line. This

working is sometimes used. This permits the simultaneous transmission of signal in both directions on the one line. Two simplex circuits, one in each direction, are sometimes combined to give duplex facilities (two-way simplex).

Differential duplex is often used on inland networks and Bridge duplex is extensively used for submarine cable circuits. Simplex working is illustrated in Fig. 6, and only one station can transmit at a time under the control of the send-receive switch which is normally on the receive contact.

The Bridge duplex is based on the principle of the Wheatstone's Bridge, and depends for its action upon the balance of potentials across a relay connected in the diagonal of the bridge. The line-signal conditions give potential balance and unbalance conditions to operate the relay.

An extension of the duplex principle gives quadruplex working, which is a duplex system in which simultaneous transmission of two messages in each direction is possible over a single circuit. One message is given by the direction of current flow and the other by the actual current value.

*High-speed Automatic Systems.*—In automatic systems the signals are transmitted by mechanical means instead of by manually operated keys. A much greater speed is obtained and the signals are more accurately formed. Most telegraph systems operated to-day are automatic. The Creed system enables an operator to operate a keyboard to tap out the message, which is delivered in printed form. This system had its origin in the Wheatstone automatic system. The Baudot multiplex system is another form. Automatic Wheatstone and Baudot systems are still used in certain applications, but the Brit. Post Office have abandoned both for inland telegraph working in favour of the start-stop teleprinter system.

The Wheatstone automatic system was first produced in 1867, and in a modified form is still in extensive use to day on submarine cables, because of its speed superiority over teleprinter working. It is a development of the Morse system and can work at some 300 words a minute. Three instruments are required: (1) a perforator by means of which holes representing the Morse code are punched in a paper tape; (2) a transmitter which sends out mark and space currents to line in accordance with the punched holes; (3) a receiver for recording the transmitted Morse signals. The system may be worked simplex or duplex. The message is prepared on a paper tape, perforated according to the long and short signals of the Morse code, the disposition of the punched holes about central guiding holes in the tape giving the dot or dash. The perforated strip is run through an automatic transmitter, which results in corresponding currents (mark or space) being transmitted to line. The receiver consists of a polarised relay with a tongue carrying an inked wheel which writes on a moving strip of paper; the message is translated by operators. In modern forms of the system a reperforator is used to produce a perforated tape at the receiving end, precisely similar to that at the transmitting end. This tape may be used to retransmit the message by passing it through an automatic transmitter con-

nected to another circuit; or, by passing it through a suitably designed printing instrument, the message is recorded in Rom. characters.

The Creed keyboard perforator eliminates the perforation of the punched holes as a separate operation. The mechanism incorporates a keyboard similar to a typewriter, and operation of the keys causes a tape to be perforated in accordance with the Morse code. Sixty words a minute can be obtained with the keyboard perforator.

The Baudot system, first produced in 1874, is a multiplex printing system worked double current. It uses a five-unit code in which each character is made up of a combination of five currents, each current being positive or negative. The duration of each current is equal, and thus each character has equal transmission time. A multiplex system may be defined as a multiple-way arrangement of sending two or more messages over the same line by the allocation of the exclusive use of the line in rapid succession. A number of operators are given the exclusive use of the line for a time sufficient to transmit one character. This principle is sometimes referred to as 'time-division multiplex.' Multiplex working clearly permits line-plant economy as a greater utilisation of one line is obtained.

Signals are transmitted and received by means of segmented distributors with contacting brushes rotated in synchronism at each end of the line. The distributors enable up to six operators to use the line during one revolution of the brushes around the distributors. Assuming six operators, the distributor periphery is divided into six sections, each serving one operator. Each section is further sub-divided into five segments. The rotating brushes make contact with the corresponding segments in the respective sections at the same time. Each successive segment at each end is thus in circuit with the line for the short time the brushes rest on them and, during this time, information may be passed between the two segments. One character is transmitted during the passage of the brushes over the five segments of a section. Thus six operators may transmit one character each, and be received by six separate receiving mechanisms, during one revolution of the brushes.

The transmitter consists of five keys, and their operation to transmit a character results in a positive or negative battery being applied to each of the five segments of the particular distributor serving that operator. These five respective currents (positive or negative) are successively transmitted to the receiving end when the transmitting brush moves over the five successive segments. On further rotation over the five segments of the next section a character from another operator is transmitted. At the receiving end the five successive currents forming a character cause the operation of five receive electro-magnets, via the corresponding receive distributor segments. In this manner the position of the five keys at the

transmit end is reproduced in the position of the five receive magnet armatures, the operation of which controls the printing of the character.

The five-unit code, with keys having two positions, allows thirty-two possible combinations, and thus characters, and provides a signal alphabet which is much shorter in transmission time than the Morse code.

*Start-stop Teleprinter Working.*—Modern inland telegraphic communication is now carried out by teleprinters, and this method has almost entirely superseded other means such as keys and sounders, Wheatstone and multiplex systems. The teleprinter consists of two main parts: (1) the transmitter and (2) the receiver, which are mounted upon the one base and are driven by a small electric motor. The transmitter consists of (a) a typewriter type keyboard and (b) a transmitting unit, controlled by the keyboard, which transmits signals in the form of electrical impulses. The receiver part consists of (a) an electro-magnet, operated by the line signals, and (b) a mechanism which causes the character corresponding to the signals to be printed on a moving paper tape.

The Morse code is an unequal length code as the characters are represented by varying numbers of dots and dashes. This varying signal time complicates machine T. and for this reason modern teleprinter working uses the Murray five-unit signal code. Here the signal time for each character is the same. The code derives its name from the fact that five electrical impulses of equal duration are transmitted for each character. Various formations of these impulses make up the different characters. In double-current working space signals are positive battery and the mark negative battery. The maximum number of different characters that can be obtained is thirty-two and since it is necessary to transmit numerals and other characters as well as the alphabet, the machine is arranged to use the same combinations for figures as for letters. The change is accomplished by means of figure and letter shift signals, and two keys to give these appear on the keyboard. Start and stop pulses accompany every character combination. The motors run continuously, but when no signals are passing the transmitting and receiving mechanisms are at rest. When a key is depressed both mechanisms make one revolution, during which time the start pulse, character combination, and stop pulse are sent. At the receiving end the start pulse sets the receiving mechanism in motion for one revolution. The character combination is received while the mechanism is in motion and finally the stop pulse is received, which stops the receiver mechanism. Both the transmitting and receiving mechanisms make one revolution for each character signalled and then stop, hence the term 'start-stop.' The start and stop signals obviate maintaining continuously correct phase relationship between the teleprinters at each end of the line such as is required

in multiplex systems. The time for one revolution is approximately one-sixth of a second, and the system is capable of working at approximately sixty words a minute. At the receiving end the five code pulses of a character operate a single electromagnet, and the successive resulting movements of the armature govern the mechanical selection and printing of the character. For inland telegraph work the characters are printed on a tape. For press work the message may be page printed.

In circumstances where the traffic is too heavy for direct key board operation automatic tape transmission may be used. Instead of transmitting the signals direct to line as each key is depressed, the operator prepares the message, to the five-unit code, on perforated tape. This is then fed through an automatic tape transmitter which transmits signals to line in accordance with the information on the tape.

*Repeaters.*—With direct-current signalling the speed at which long circuits, having large values of capacitance and resistance, can be worked is limited. A repeater inserted in the line permits a greater speed, as the repeater effectively breaks the line up into a number of shorter links. The simple type of repeater consists of the reception on a relay, of a signal and its retransmission from the contacts of the relay to the receiving station. Any signal distortion on the first link is carried forward to the second link. A regenerative repeater is one which accepts distorted signals and retransmits them as reshaped signals free from distortion. This type has application in repeating Wheatstone signals to enable long submarine cable circuits to be extended via land lines.

*Telegraph Signalling.*—Direct-current signals are subject to considerable distortion and the signal may become unreadable. This may be overcome by the insertion of repeaters, but on inland networks the modern method is to signal by means of alternating currents in the voice-frequency range. Such signals can be passed over standard telephone trunk lines, which are amplified with thermionic valve amplifiers. A.C. signals retain their shape in transmission with sufficient accuracy almost without distance limit, and the distortion is small. The Brit. Post Office and many other administrations use a multi-channel voice-frequency signalling method for inland networks. In this system eighteen telegraph channels are obtained on one line. Each channel has its own signalling frequency, which is transmitted within a narrow frequency band. The eighteen signalling bands are contained within the normal frequency band of a four-wire telephone circuit.

Facsimile, or picture T., which is a system for transmitting still pictures, or printed matter, over an electrical circuit, is now finding increasing application, particularly for press work. A typical technique incorporates a sender, which is arranged to scan the picture in a regular manner by means of a light-spot. The

variations in tone of the picture are interpreted into variations in amplitude of alternating currents passed to line to a receiver. Here a light from a constant source is arranged to fall on a piece of photographic material and scan this at exactly the same rate as the sender light-spot. The variation of incoming current from the line operates a light-valve, which controls the intensity of the light falling on the photographic material to reproduce the original picture. For T. systems see also under POST OFFICE; for submarine cables see CABLES; also under SIGNALING, MILITARY. See W. T. Perkins, *Telecommunications* (3rd ed.), 1948.

**Telegraphy, Wireless.** see WIRELESS TELEGRAPHY. See also under RADIO.

**Teleilat-el-Ghassul**, see under TRANSJORDAN, *Prehistory and Ancient History*.

**Telekinesis**, see under SPIRITUALISM.

**Tel-el-Kebir**, see TEL-EL-KEHIR.

**Telemachus**, see under PENELOPE.

**Telemark**, fylke of Norway, on the S. coast. It is a mountainous region, with vast reserves of timber. Skien, bp. of Ibsen (his *Peer Gynt* has its setting in T.), is the cap. Industries include timber, paper, and salt-petre. T. contains some of Norway's wildest and most picturesque scenery. Of particular interest is Rjukanfoss (415 ft.), one of Europe's finest waterfalls, providing power for nitric acid works, etc. Pop. exceeds 130,000.

**Telemeter**, see RANGE-FINDERS.

**Teleology**, see under KANT; HEGEL.

**Teleosteans**, or **Teleostei**, see BONY FISHES.

**Telepathy**, name given by F. W. H. Myers to the transference of knowledge from one mind to another without the use of any normal sensory channel of communication. The reality of this power was proved in the early days of the Society for Psychical Research, but it was generally supposed to be restricted to a few exceptional individuals. The more recent work of Prof. Rhine at Duke Univ. has shown that it is much more widespread than was at first supposed, and that the paranormal acquisition of knowledge is not restricted to what is in another person's mind, since a fact not known to any other person may also be known without the use of any normal sense channel. T. is thus only one example of a more general paranormal power of obtaining knowledge often now referred to as extra-sensory perception (or the *psi* capacity). Experimental work in extra-sensory perception is commonly done by a method of guessing the order of a pack of twenty-five cards containing five each of five symbols, and performing a statistical analysis of the results to discover whether more have been guessed right than can be accounted for by chance. Explanations of T. by unknown radiations acting on an unknown sense organ are now generally rejected. It seems necessary to make a more radical reorientation of the theory of the way in which knowledge is obtained.

From time to time performances of alleged T. are shown on the variety stage. It would be rash to assert that none of

these performers has T. powers, or that they never use them on the stage. On the other hand, most of these performances depend on the use of codes or other means known to conjurers. In all cases the conditions of a stage performance are altogether unfavourable to critical determination of whether genuine T. has been used. See Prof. J. B. Rhine, *The Reach of the Mind*, 1948, and R. Heywood and S. G. Soul, *Telepathy and Allied Phenomena*, 1948.

**Telephony**, system of reproducing sounds at a distance by the agency of electricity. The possibility of T. originated with Faraday's discovery of electro-magnetism (see ELECTRICITY AND MAGNETISM). Bourseul (France, 1854) and Reis (Germany, 1861) conducted experiments which had the rudiments of electric T., but credit for the production of the first practical telephone is due to Alexander (Graham) Bell (*q.v.*) (U.S.A., 1876). In Bell's original electro-magnetic telephone the receiver and transmitter were similar in construction and consisted of an electro-magnet with a pivoted armature connected to the centre of a flexible diaphragm. The two instruments were connected together with a battery in circuit. The current, flowing round the electro-magnet windings, produced a magnetic field (or flux) of magnitude dependent on the reluctance (or magnetic resistance) of the air-gap between the end of the electro-magnet and the armature. Sound-waves created by speech vibrated the diaphragm which varied the air-gap, varied the reluctance, and thus the magnitude of the magnetic field. The varying field, cutting the turns of the electro-magnet winding, induced a varying e.m.f. which resulted in a flow of fluctuating current round the circuit, the current fluctuations corresponding to the speech. At the distant end the battery current, magnetising the electro-magnet, produced a steady pull on the armature. The addition of the fluctuating speech current resulted in a varying magnetic pull on the armature which vibrated the receiver diaphragm in a manner similar to that of the transmitter and thus reproduced the speech. The disadvantage of this system was the insensitivity of the electro-magnetic transmitter. The initial energy of speech is small, and, with losses, the received electrical energy was insufficient to give adequate volume except on short lines. This has been overcome in modern T. by using a transmitter functioning as a variable resistance. Here the weak energy of speech is used merely to control a much greater energy given by a battery. The modern transmitter is of the form shown in Fig. 1 and is based on the carbon-granule principle suggested by Himmings in 1881. Two carbon electrodes, connected to a source of steady current, are immersed in a chamber filled with carbon granules. The rear electrode is fixed and the front electrode attached to the centre of a light cone-shaped duralumin diaphragm clamped round its periphery. Normally the current flows between the two electrodes, and the

carbon granule path presents a steady resistance. Vibration of the diaphragm due to speech moves the front electrode, and this causes a greater or less area of contact between the granules, which varies the electrical resistance between the two electrodes. The current normally flowing is thus varied, and in this manner the speech energy controls the battery current.

The modern receiver, shown in Fig. 2, is based on the principle of the original

ponents of the fluctuating direct current in the transformer primary (P) circuit induce an alternating e.m.f. into the secondary (S) circuit, which includes both receivers and the line. The diaphragm of the receiver at B is therefore set vibrating to reproduce the speech. Similarly speech at A causes the receiver at A to vibrate to reproduce the speech. Local battery telephones are not widely used to-day.

The first telephones installed were for the purpose of communication between

CARBON ELECTRODES

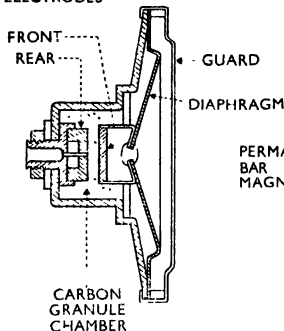


FIG. 1. MODERN INSET TRANSMITTER

ELECTRO-MAGNET

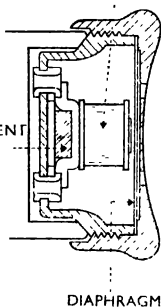
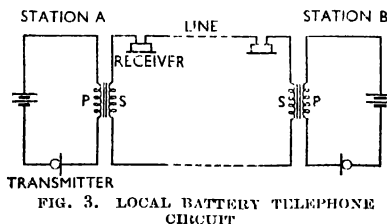


FIG. 2. MODERN INSET RECEIVER

Bell receiver. Two small electro-magnets are attached to a bar magnet, the permanent field of which exerts a steady pull on a diaphragm of magnetic material (stalloy). The alternating speech currents, flowing through the electro-magnets, set up magnetic fields which alternately aid and oppose the permanent field. The pull on the diaphragm is thus varied and the diaphragm vibrates to reproduce the speech.

two fixed points. It was soon realised, however, that the utility of the telephone would be greatly enhanced if a means could be devised whereby any telephone could be connected at will with any other telephone in the neighbourhood. For this to be possible it is necessary either to run wires between each and every telephone in the dist., which is obviously impracticable, or alternatively to connect all the telephones to some common point at which the necessary connections can be made. The building or office used for the interconnection (or switching) of the telephones naturally became known as a telephone exchange. The users of the telephones connected to an exchange paid a periodical subscription for the service they received and hence became known as subscribers. Equipment is necessary at the exchange for terminating all the lines and for the interconnection of the lines as required. Originally, and indeed to a considerable extent to-day, oral instructions were given as to the connection to be made and the required switching was effected by hand. Such exchanges are known as manual exchanges to distinguish them from automatic exchanges, where the switching of one telephone to another is done by machines without human aid at the exchange.



TRANSMITTER

FIG. 3. LOCAL BATTERY TELEPHONE CIRCUIT

Early telephone systems were based on the principle shown in Fig. 3. Batteries at the premises of the telephone subscriber, known as local batteries, supply current to each transmitter around local circuits, as the transformers prevent the steady battery current from flowing in the external line. Sound-waves, falling on the transmitter at A, vary the pressure on the carbon granules, vary the transmitter resistance, and the transmitter current fluctuates. The alternating com-

ponents of the fluctuating direct current in the transformer primary (P) circuit induce an alternating e.m.f. into the secondary (S) circuit, which includes both receivers and the line. The diaphragm of the receiver at B is therefore set vibrating to reproduce the speech. Similarly speech at A causes the receiver at A to vibrate to reproduce the speech. Local battery telephones are not widely used to-day.

position. With the introduction of the telephone exchange, in addition to the fundamental requirement to transmit speech, telephone systems were required to incorporate signalling arrangements to inform the operator, or the automatic equipment, when a call is originated, answered, and completed.

**MANUAL TELEPHONE EXCHANGE SYSTEMS.**—The differences between the various manual systems are centred in the signalling arrangements and the location of the batteries supplying the speech and signalling currents.

**Magneto System.**—Here the speech current is supplied by local batteries at

of C.B. manual working. While a number of battery points are shown, all are the one battery. When the receiver is on its rest a bell and a capacitor are bridged across the line. The capacitor permits the flow of alternating current, which is applied to ring the subscriber's bell, but prevents the flow of direct current from the exchange. When the receiver is lifted, however, the line is bridged with a circuit of low resistance which includes the transmitter, and direct current flows from the exchange. The removal of the receiver at A operates relay L around the line circuit and contact L 1 lights his calling lamp at the exchange. The operator inserts the

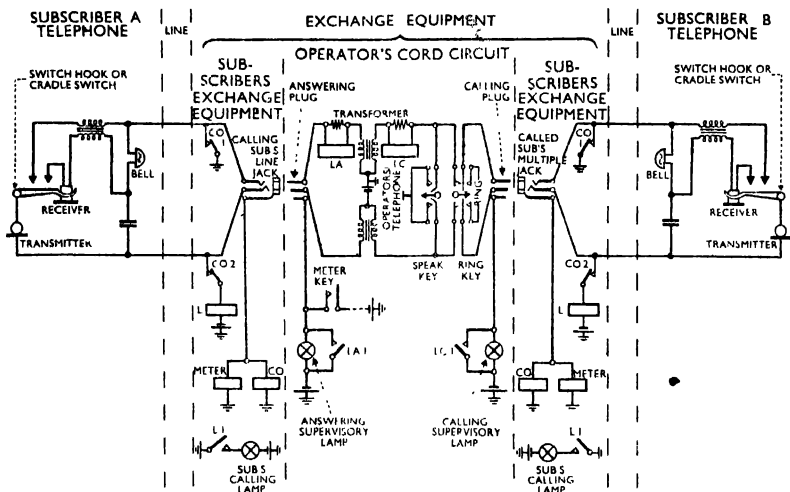


FIG. 4. CENTRAL BATTERY MANUAL EXCHANGE SYSTEM

the subscriber's premises and the signalling by currents generated by the subscriber operating a small electric generator (magneto generator) incorporated in the telephone instrument. The signalling currents operate electro-magnetic indicators on the operator's switchboard.

**Central Battery Signalling (C.B.S.) System.**—Here the speech current is supplied by local batteries at the subscriber's premises, but the signalling current for all the subscribers on the exchange is supplied by a central battery at the exchange. The operator receives the signals by lamps on the switchboard. The signalling is automatic, being controlled by the removal or replacement of the receiver.

**Central Battery (C.B.) System.**—This is the more modern manual system. No local batteries are required at the subscriber's premises. A central battery at the exchange supplies current for both speech and signalling for all the subscribers on the exchange. The signalling is automatic. Fig. 4 shows the principle

answering plug of a cord circuit into the calling subscriber's jack. This operates relay CO which disconnects relay L, and L 1 darkens the calling lamp. Current is now fed to subscriber A from the exchange battery via the transformer. This current operates relay LA and contact LA 1 short circuits the cord circuit answering supervisory lamp to prevent it glowing. The operator throws the speak key which connects her telephone to the subscriber's line and ascertains the required number. If the subscriber is free the operator inserts the calling plug of the cord circuit into the required subscriber's jack and rings B by throwing a ring key which connects ringing current to line. When B answers the removal of his receiver permits a current to flow from the exchange battery around subscriber B's line. Relay LC operates on this current and LC 1 darkens the calling supervisory lamp which informs the operator that B has answered. She then releases the ring key to cease the ringing. At this stage the two subscribers are supplied with

transmitter current from the exchange battery via the transformer, and the subscribers may speak to each other. The transformer permits independent subscriber signalling on each side of the cord circuit. The varying speech currents from one side are induced across the transformer to vary the direct current on the other and thus transmit the speech. When A replaces the receiver the exchange current path is broken, relay LA releases, and LA 1 releasing allows the answering supervisory lamp to glow. This signals the operator that subscriber A has released. Similarly when B replaces the receiver the current flow in the calling side of the cord circuit is disconnected, relay LC releases and LC 1 causes the calling supervisory lamp to glow, which signals the operator that B has released. The operator depresses a meter key which records the call on the calling subscriber's meter. She then removes the plugs from the jacks to clear the connection.

Many operators are required in large exchanges, and to permit each operator to plug into any line all the subscribers' lines on the exchange are multipled. The load on the exchange is divided equally among the operators and each attends to a certain number of subscribers. The line jacks and calling lamps of each group of subscribers appear in the home section of the switchboard in front of the respective operators. The operators answer the subscribers at the home section. As each subscriber must have access to any other subscriber on the exchange, all the subscribers' lines are multipled round the multiple section of the switchboard, so that they appear a number of times. Each appearance of all the lines in the multiple is arranged to be within arm's reach of each operator. This allows each operator to connect any subscriber on her home section to any other subscriber on the exchange without moving from her seat. The size of an exchange is controlled by the size of the multiple appearance accessible to each operator, and for this reason exchanges are limited to 10,000 subscribers. An operator ascertains that the required line is free or not by tapping the end of the calling plug on the required subscriber's multiple jack. If the subscriber is engaged the operator hears a click in her telephone; if free no click is given.

While many manual exchanges are in service, modern practice is to fit automatic exchanges.

**AUTOMATIC TELEPHONE EXCHANGES.**—In automatic working machine equipment at the exchange completes the call without the aid of an operator. The subscriber controls the exchange equipment by the operation of a dial which is part of the telephone instrument although a certain number of operators are still required to assist the subscriber in case of difficulty, trunk calls, etc. All automatic systems are based on the central battery system, in that a main battery at the exchange supplies the current for both speech and signalling.

The first patent for an automatic system

was granted to Connelly and McTighe (U.S.A., 1879). While crude and impracticable, it disclosed a device employing some of the principles used in modern systems, among them that of step-by-step switches in an exchange moved by a succession of current impulses from the subscriber's premises. Later, Strowger (U.S.A.) made a number of inventions which marked the realisation of the ideas advanced by Connelly and McTighe. One of his patents (1891) is now generally regarded as the origin of practical step-by-step systems. The first public automatic exchange, based on the Strowger system, was installed at La Porte, Indiana, in 1892, and a demonstration model for 200 lines was installed in London in 1897. For a considerable time the main development of automatic T. took place in the U.S.A., and a number of exchanges were opened in that country. In 1912 the first public automatic exchange in Great Britain was opened at Epsom. This exchange was based on the Strowger step-by-step principle.

In recent years the development of automatic systems has proceeded at a rapid rate, and there are now five principal systems in use throughout the world: (1) step-by-step (Strowger) system; (2) panel system; (3) crossbar system; (4) rotary system; and (5) relay system. Of these the step-by-step system is most widely used and is the present standard system of the Brit. Post Office.

**Step-by-step (Strowger) System.**—The exchange equipment in this system consists of three fundamental units: (1) line switches; (2) group selectors; and (3) final selectors. The operation of the equipment is controlled by the subscriber's dial, which interrupts the current from the

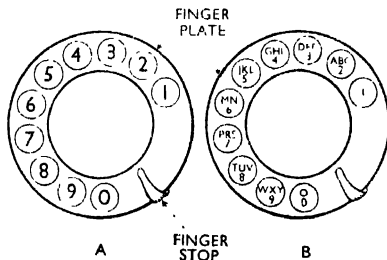


FIG. 5. DIAL

A, numbered dial, B, numbered and letter dial. (One-third actual size.)

exchange at regular intervals, depending on the digit dialled. These electrical impulses operate the group and final selectors which seek out the called line and connect the calling line to it. The general appearance of a dial is shown in Fig. 5. Forward rotation by the finger winds a main spring, which subsequently returns the dial to normal. On the return a gear mechanism drives a small governor to control the speed of return, and a

toothed wheel operates spring sets, which break and make the electrical circuit at a speed of ten interruptions per second. This interrupts the current flowing from the exchange, and these current pulses operate the exchange equipment. The number of impulses corresponds to the digit dialled. The selector switch used in step-by-step systems is a two-motion type in that it is actuated first vertically and then horizontally. The switch consists of three main units: (1) relays; (2) contact bank; and (3) switching mechanism, including wipers, shaft, and controlling magnets. A relay is an electro-magnetic device used for making or breaking connections in an electric circuit. Fig. 6 shows a typical telephone relay.

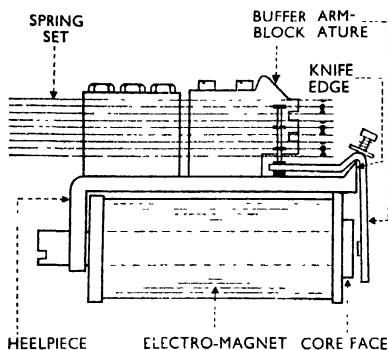


FIG. 6. MODERN TELEPHONE RELAY

The magnetic circuit consists of the coil core, the heel-piece, and the armature, all of good magnetic material. When a current flows in the coil the armature pivots on the knife-edge, and is attracted to the core face. The spring assembly is actuated by the armature and is arranged, by the making or breaking of the contacts, to provide the desired electrical circuit conditions.

The two-motion switch bank is somewhat comparable to the subscribers' multiple jacks in a manual exchange. The assembly consists of two banks (private and line) mounted at the bottom of the mechanism. The top (private) bank consists of 100 contacts arranged in ten horizontal rows of ten contacts each, arranged in a semi-cylindrical form so that a pair of wiper springs on the selector shaft may make connection with any contact in the 100 group. The shaft raises the wipers to the horizontal level and then rotates the wipers over the level to the desired contact. The lower (line) bank contains 200 contacts arranged in ten horizontal levels, each having ten sets of two contacts each. In some cases the selector has 200, instead of 100, circuits wired to the bank, and there are three banks, one private and two line.

The corresponding bank contacts of a group of Strowger switches are multiplied

together to provide the same basic arrangement found in manual multiple switchboards. The subscriber's line is thus accessible from a number of switches.

The basic two-motion switch mechanism consists of an electro-magnetic device that is capable of raising, rotating, and releasing a wiper-carrying shaft. The Strowger two-motion selector consists of a central shaft carrying flexible spring wipers at the lower end. These springs make contact with the required bank contact by wiping over the level to which the shaft is raised—hence the name 'wipers.' Two notched ratchets, the vertical and rotary ratchets, are attached to the shaft. Two electro-magnets, the vertical and rotary magnets, by attracting their respective armatures control the motion of the wiper-carrying shaft. When the vertical magnet is impulsed a pawl engages with the vertical ratchet, and the shaft (and wipers) is stopped vertically to the bank level corresponding to the digit dialled. When the rotary magnet is impulsed a pawl engages with the rotary ratchet and the wipers are rotated horizontally over the level to the desired contact. To release the selector the rotary action is continued until the wipers disengage from the bank. In this position the shaft falls, and when clear of the bank it is turned back to its normal position by a spring.

**Line Switch.** The line switch mechanism is self-actuated and is independent of dialled impulses. The wipers move round a bank of contacts in one direction only, and for this reason the switch is called a uniselector. It searches for a subsequent switch wired to its contact bank. This subscriber's uniselector automatically connects the calling line, wired to its wipers, to an idle two-motion selector wired to its bank, when a call is initiated and before the subscriber commences to dial. The switch overcomes the fitting of the more expensive two-motion selectors to each subscriber's line, by multiplying the bank contacts of a number of uniselectors, access from the subscribers' lines concerned is given to a relatively small number of two-motion selectors, and the latter are thus made available to any one of the lines. The uniselector consists of a number of levels, each of which is provided with twenty-five contacts and a wiper. When the electro-magnet is operated a pawl rotates a ratchet wheel which carries the wipers, and these are moved over the contact bank. Contact springs, operated by the armature, make and break the circuit of the electro-magnet to give the self-drive feature. In certain cases it is more economical to adopt line-finder instead of subscriber uniselector working. Here the subscriber lines are multiplied to the banks of the line-finder switches, the wipers of which are permanently connected to the wipers of a two-motion selector. The line-finder hunts to find the calling line, whereas the subscriber's uniselector hunts to find a two-motion selector. Unlike the uniselector system, a line-finder switch

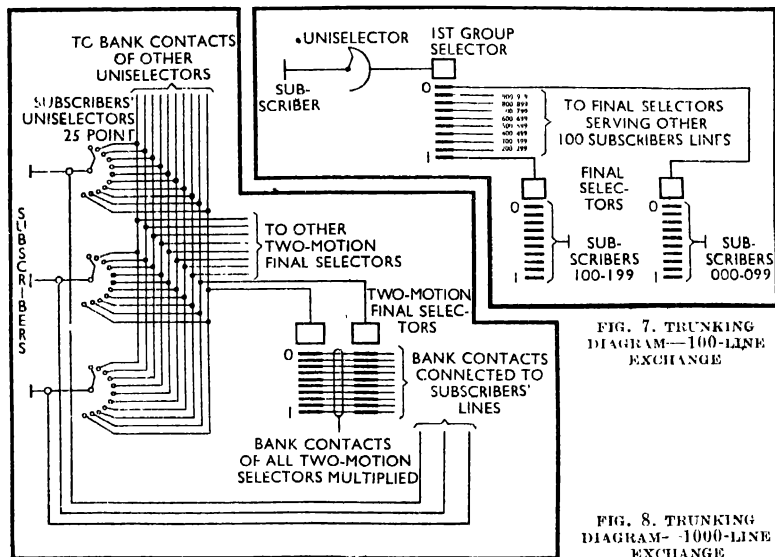


is not fitted individually to each subscriber's line.

**Exchange Trunking.** A feature of the step-by-step system is the straight-forward decimal selection. The number of selector stages required depends on the number of subscribers on the exchange. Fig. 7 shows the trunking of a 100-line exchange. As all the subscribers on the exchange can appear on the bank of a two-motion switch only one selector stage, the final selector, is required. A number of selectors are multiplied together, the actual number depending on the traffic.

lines. The size of automatic exchanges is usually limited to 10,000 lines. Extension of this selector switch stage principle permits calls to be routed from exchange to exchange and the ultimate objective of telephone administrations is to permit any subscriber, national or international, to be called by a system of long-distance dialling.

**Basic Working.**—When the receiver is removed the subscriber's unselector searches for and connects a 1st group selector to the calling subscriber's line. A dial tone is now transmitted to the



The first (tens) dialled digit steps the final selector vertically, and the second (units) digit steps it rotary to the called line. The capacity of the exchange may be extended by additional switching stages known as group selectors, and Fig. 8 shows the trunking of a 1000-line exchange, which is regarded as consisting of ten 100-line groups. Access to a group is obtained by the additional switching stage, and three digits are dialled by the subscriber. The additional stage (1st group selector) steps vertically to the first (hundreds) dialled digit, and then hunts automatically over the level to find a free final selector in the particular hundreds group. The final selector responds vertically to the second (tens) dialled digit and rotary to the (units) digit. If ten similar arrangements of the group and final selectors shown in Fig. 8 are provided, and a bank of 1st group selectors added so that the 1st group selectors in Fig. 8 now become 2nd group selectors, the capacity of the exchange is 10,000

subscriber, informing him that he may now dial. The dialled digits route the call through the sev. switching stages, and the wipers of the final selector are positioned on contacts to which the called line is connected. If the line is engaged a busy tone is returned to the calling subscriber. If the line is free the bell is rung by ringing current applied to the required subscriber's line from the final selector. At the same time a ring tone is transmitted to the calling subscriber to inform him that the required number is being rung. When the call is answered, ring and ring tone are ceased, the call is automatically metered against the caller and a speaking circuit is completed by the exchange equipment. The connection is held under the control of the calling party. When the receivers are replaced the exchange equipment is released for use on other calls.

**Multi-exchange Areas.** In an area where the total number of subscribers does not exceed 10,000 and these are

served by a number of exchanges, the traffic can be routed to the various exchanges from the 1st group selector levels. As a typical case, assume subscribers 2000-4999 are served by exchange A, 5000-6999 by exchange B, and 7000-8999 by exchange C. The 1st group selector levels can then be so arranged that levels 2-4 serve exchange A, levels 5-6 exchange B, and levels 7-8 exchange C. Larger areas would contain a number of 10,000 line exchanges, and here the subscriber is required to dial routing digits in addition to the numerical number. Assuming an area of up to ten such exchanges, the subscriber would dial five digits, the first of which would route the call to the required exchange. This digit is received by a rank of routing group selectors in each exchange, the levels of which are connected to the 1st numerical group selectors in the respective exchanges. This first digit may be a number or a letter, and in the latter case the dial has both numbers and letters. In very large areas the number of routing digits is increased, and a system of 'director' working is usually adopted. It is usually desirable, though not necessary, that direct trunks be provided from each exchange to all others in the area. Sometimes, for reasons of line-plant economy, traffic is circulated to the objective exchange via intermediate exchanges. This is known as tandem working, and this method is usually adopted for large city areas.

**Step-by-step System. Director Working.** The director method of working is used for the large cities in Great Britain, in a number of areas in the U.S.A., and in other countries. In such areas the number of junction groups to give each exchange direct access to all others becomes very large and, to economise in line plant, 'tandem' working is adopted. The extent of tandem working must be flexible, but, irrespective of the routing necessary to complete a call, each exchange must be obtained by dialling a fixed code to permit a common directory to be used throughout the area. This involves the use of equipment which will automatically change the dialled code digits into other digits appropriate to the particular routings. This feature is known as 'translation.' Each exchange must have a dialling code containing the same number of digits. As the area may have 100 exchanges or more, it is necessary for each code to consist of three digits to obtain a sufficient number of code digits. In director areas, therefore, subscribers dial a total of seven digits, three code and four numerical. The three code digits for any exchange are the first three letters of the exchange name and the dial used is of the type shown in Fig. 5(B), having letters as well as figures. The directory is so printed that the first three letters of the exchange name stand out in heavy type capitals (CENTRAL 2345). Each letter, of course, has a numerical equivalent, letters A, B, and C being two impulses, and so on. Director equipment is provided at each exchange in a director area and, as the

name suggests, the equipment is used to direct the call to the required exchange. The director receives all the digits dialled by the subscriber, translates the three code digits into two to six digits as necessary to route the call to the required exchange, and transmits these digits followed by the four non-translated numerical digits. The trans. code digits step code selectors (1st, 2nd, etc.) to route the call, the numerical digits from the director then step the group and final selectors in the required exchange in the usual way. Director equipment is only required during the setting up of a call; it releases after the numerical digits have been sent and becomes available for other calls.

**The Panel Automatic Telephone System.**—The panel system is a development of the Western Electric Company Ltd. (Bell Laboratories), U.S.A., and is primarily for use in large areas. It is fitted in many areas in the U.S.A., including New York. The system differs from the Strowger in the basic design of its switch and bank, and in the fact that the switching functions are estab. largely by motor-driven units rather than by electro-magnetic armature operation type of units. The use of a motor drive requires indirect control of the switching equipment by register senders. The motor-driven switch mechanism carries contacting brushes vertically upward to establish a connection with the desired vertical bank contact field. The elevating members are under the control of electro-magnetically operated clutches whose action is controlled by relays.

When the caller removes his receiver a line-finder motor-driven contacting brush is set in operation, and moves upwards into a bank of contacts to find the calling line. At the same time auxiliary equipment selects a sender and connects it temporarily to the calling line. The subscriber now receives the dial tone and dials. The dialled impulses are received by the sender and are trans. into pulses which control the operation of various selector mechanisms (called dist., office, incoming, and final selectors) to establish a circuit through to the called line. A sender is in operation only for the setting up of the call, and then releases for use on other calls. A group of senders is common to the whole exchange. The selector frames are so arranged that as many as 500 sets of terminals can be made available to each selector.

The register sender is thus a device for translating the digits dialled by the subscriber into information to control selection through the switching stages. The device is necessary, as the panel system is not a direct-action decimal selection system under the control of the dial like the Strowger step-by-step system. The code routing digits are trans. to facilitate flexible tandem routing through the network.

**The Crossbar Automatic Telephone System.**—The Bell Laboratories developed the crossbar system to supersede the panel system. New exchanges in large cities (U.S.A.) will be crossbar, and a

number are already fitted. The crossbar system is not step by step; it is similar to the panel system in that it makes use of a sender. Whereas the panel system employs motor-driven, line-finder, and selector mechanisms, the crossbar system consists wholly of relay type crossbar switches and multi-contact relays, and no motor drive is required. Connections between the subscriber's lines are accomplished by the operation, controlled by senders and markers, of the cross bar units.

In the Strowger step-by-step system apparatus used to set up the call is held engaged during the speech period, although not required during this period. It is sometimes argued that this is wasteful in apparatus: the crossbar system has a sender-marker method of control to overcome this. This method permits apparatus common to all the subscribers, to be used to set up the call to the required subscriber. This apparatus is then released prior to the speech period, and is then available to set up calls from other subscribers.

The crossbar switch is the basic switching unit, and consists of three major parts: (1) twenty separate vertical circuit paths; (2) ten separate horizontal circuit paths; and (3) a mechanical means for connecting any one of the twenty vertical paths to any one of the ten horizontal paths by the operation of electro-magnets.

#### FROM TWENTY LINES

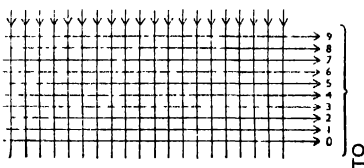


FIG. 9. PRINCIPLE OF THE CROSSBAR SWITCH

Fig. 9 shows the schematic arrangement of the switch and ten simultaneous connections can be established, one on each horizontal path. The number of lines that can be connected to the same ten trunks may be increased by adding other switches wired to different groups of twenty lines and connecting the horizontal contacts in multiple to other switches. The assembly of switches is called a link frame.

*The Rotary Automatic Telephone System.* This is used in some European and S. Amer. countries, and in some centres in the U.S.A. The switches are uniselectors. The operating mechanism consists of a motor-driven shaft to which the wipers of the sev. switches in a group are geared. The driving mechanism is placed in operation by means of an electro-magnetic clutch which brings a flexible gear into temporary contact with the shaft driving gear. The register in the rotary system operates in much the same manner as the sender in the panel system. Power-driven rotary line-finder switches

locate the calling line and extend it temporarily to the register. The register receives all the dialled impulses from the calling subscriber, stores and translates them, and then transmits pulses to control the operation of the subsequent power-driven numerical selecting switches to find the required subscriber's line. The selectors have a bank capacity of 200 or 300 circuits, arranged in ten levels of twenty or thirty circuits each. They have one set of wipers for each level, and an auxiliary shaft to select one of the ten sets of wipers. By this means the operation of the switch is limited to a rotary action. There are many other types of automatic telephone systems, but they are not fitted in sufficient quantity to be regarded as prin. systems.

*Automatic Trunk and Toll Working.*—The usual present method of trunk and toll working on automatic networks is for an outgoing controlling operator to dial the required subscriber over the network, and record particulars of the call on a ticket which is then used for costing purposes. In recent years considerable attention has been given to the problem of eliminating the controlling operator and allow direct subscriber to subscriber dialling of trunk and toll calls. Direct subscriber dialling requires other means than operators' tickets for costing the calls, which cost varies with distance and duration. Increasing use is being made by some telephone administrations of equipment for automatic ticketing of calls to permit direct trunk subscriber-to-subscriber dialling. This facility requires equipment to identify the calling line and an automatic ticketing machine which may produce a printed ticket, or a punched tape, recording all particulars of the call, including the charge.

Other telephone administrations, particularly in Europe, have adopted a repeat metering process whereby the normal subscriber's meter is automatically operated a number of times for each call. The number of operations depends on the distance and duration of the call, and is automatically determined by equipment. One meter operation is regarded as the unit charge for a local call.

*LINE PLANT.*—Telephone lines may be overhead or underground. Overhead lines are bare copper wire, supported by porcelain or glass insulators mounted on poles. In general, modern practice is to lay underground cables which are of the paper-insulated or coaxial type. Paper-insulated cables consist of many copper conductors, each separated by paper, and all contained within a lead sheaf. In certain cables, inductance, in the form of loading coils inserted at regular intervals, is added to improve the transmission characteristic. Long-distance circuits are invariably four-wire, one pair to carry speech in one direction and the other pair for the reverse direction. The four-wire circuit is converted to two-wire at each end. On long-distance circuits, thermionic valve amplifiers, inserted at appropriate points, amplify the speech to compensate for the transmission loss.

Line plant is expensive, and often a system of carrier working is adopted to increase the circuit-carrying capacity of a single line. Carrier working permits a better utilisation of the frequency band which a line is capable of transmitting.

Country	Total Number of Telephones	Per 100 Pop.
U.S.A.	31,866,800	24.2
Sweden	1,450,500	21.2
Canada	2,213,400	17.4
New Zealand	300,550	16.5
Switzerland	745,000	16.3
Denmark	617,600	14.8
Norway	376,500	12.0
Australia	905,000	11.9
United Kingdom	4,654,500	9.3
Belgium	531,780	6.3
Holland	576,000	5.9
France	2,108,200	5.2
Argentina	651,080	4.0
Germany	1,753,000	3.3
Czechoslovakia	350,700	2.9
Italy	958,800	2.1
Spain	510,000	1.8
Japan	1,195,210	1.5
Portugal	111,820	1.4
Brazil	468,500	1.0
World	60,610,000	2.5

A line may transmit a frequency band which is many times that required for commercial speech, and it is possible to form a number of speech circuits on the one line. This is done by shifting the speech frequencies of each subscriber to another band (modulation, *q.v.*), respective subscribers being in respective bands, and restoring the respective speech frequencies to their original position in the frequency spectrum at the receiving end of the line (demodulation). Each channel so formed is called a carrier channel and up to twenty-four channels per line may be obtained on ordinary underground cable circuits. The separation of the various carrier channels at each end of the line is performed by electric wave-filters.

Recent development in thermionic valve (see VALVES) amplifier design has made it possible to use wide-band transmission systems, where hundreds of carrier channels may be carried on one line, so permitting hundreds of simultaneous conversations on the line. Wide-band systems require a special type of cable known as coaxial. The outer conductor is a copper tube or copper tape wound in that form. The inner conductor is a bare copper wire positioned in the centre of the tube by insulating spacers. The two conductors so formed constitute the pair of a circuit, and two such tubes are required to form a four-wire circuit. At the high frequencies used in wide-band systems the current concentrates near the surface of the central conductor and inner surface of the tube, and the energy is transmitted as electro-magnetic waves in the space between the centre conductor and the tube. In submarine coaxial

cables the insulation is solid, usually paraggutta, on account of the great pressures.

**STATISTICS.**—The table opposite shows the total number of telephones in the prin. countries as at Jan. 1948, together with the telephones per 100 pop. The U.S.A. is by far the greatest telephone user in the world, having 57.5 per cent of the total world telephones.

See also POST OFFICE, *Telephones*; also under **SIGNALLING, Military**.

See T. E. Herbert and W. S. Procter, *Telephony* (2 vols.), 1934-38; A. L. Albert, *Fundamentals of Telephony*, 1943; J. Poole, *The Telephone Handbook* (8th ed.), 1944; and J. Atkinson, *Telephony* (vol. 1.), 1948.

**Teleprinters**, see under **TELEGRAPHY**.

**Telescope.** The first T. was probably made by the Dutchman Lippershey in 1608, although Galileo in 1609 constructed the first of his famous Ts. and commenced astronomical observations at the beginning of the year 1610. Roger Bacon, who lived during the thirteenth century, is often credited with the invention of the T.; while this statement is probably erroneous, it is remarkable to notice that the germ of the function of a T. is contained in his writings. The apparent size of an object depends solely on the angle it subtends at the eye; thus a sixpence may appear as large as or larger than the sun if it is held at such a distance that it subtends an angle at the eye as great as or greater than does the sun. The function of a T. is, then, to increase the angle subtended by an object at the eye, and as a result two things are judged to occur: (1) the object seems magnified, (2) the object seems to be brought nearer. The effect is, of course, a subjective one, for if we view a man 1 m. away through a T. and find that he appears to be six times as tall as when viewed by the naked eye, we estimate his distance as  $\frac{1}{6}$  m.

**Magnifying Power.**—The magnifying power of a T. is defined as the ratio of the angle subtended at the eye by the image viewed through the T. to the angle subtended at the naked eye by the object. Field-glasses commonly have a magnifying power of eight, while some of the finest astronomical Ts. have magnifying powers of the order of 1000. The principle of the simple astronomical T. can be seen by referring to Fig. 1. It consists of a convex lens (*C*) of long focal length, called the objective, and a convex lens of short focal length called the eyepiece. In order to show quite plainly how it works, a parallel beam is shown entering the objective in a direction inclined to the axis of the T.; such a beam would, for instance, fall on the T. from the edge of the sun when the axis of the T. was pointing at the centre of the sun. The objective forms a real, inverted image at *P*, below *F*, its prin. focus, and the eyepiece is moved so that *F* is at a slightly smaller distance from it than the focal length of the eyepiece, the focus of which is *f*. In order to form a virtual image at *X*, 25 cm. away from the eye, *i.e.* at the least distance of distinct vision. Without the instrument the angle subtended

at the eye by the radius of the sun would be  $\widehat{SCO}$ , but with the instrument, the angle subtended by the radius of the image of the sun is increased to  $\widehat{CEX}$ , hence the sun appears to be greatly enlarged. The objective and eyepiece are mounted in a tube whose walls are blackened on the inside to prevent confusion arising from light reflected by the walls of the tube. The instrument described above has two serious defects, viz.

piece ( $E$ ) is a concave lens of short focal length. The rays from the objective fall on  $E$ , and the final image formed by this concave lens is at  $XY$ , a virtual and erect image. The eye has, of course, been enlarged in the diagram for convenience. This instrument requires correction for spherical and chromatic aberration in a similar way to the simple astronomical T. *Reflecting Telescopes.*—Newton despaired of making a refracting T. free from chromatic aberration, and he

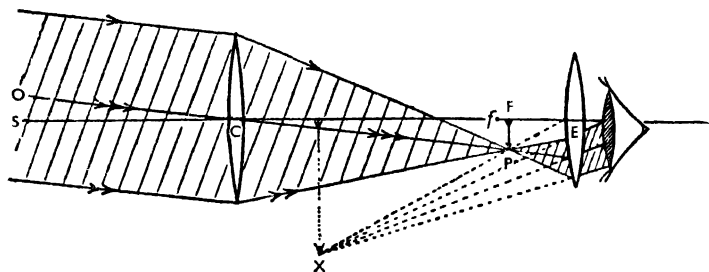


FIG. 1. PRINCIPLE OF SIMPLE ASTRONOMICAL TELESCOPE

the image suffers from *spherical aberration* (q.v.) and *chromatic aberration* (q.v.). Spherical aberration arises from the fact that a point object does not give rise to a point image when a single lens is used. The defect can be remedied by using stops and by using a compound lens. Chromatic aberration is due to the fact that the focal length of a simple lens is different for each of the coloured components of white light. The image produced is tinged with colours at its edges. The attempts to remedy this defect were completely unsuccessful until 1758, when Dolland discovered an achromatic combination consisting of a convex lens of crown glass placed in contact with a weaker concave lens of flint glass that partially corrected the dispersion produced by the convex lens, the combination behaving as a weaker convex lens. Since that time, the study of achromatic combinations has made so much progress that the Yerkes T., the largest refracting T. in the world, is constructed on the essential principles of the simple astronomical or refracting T. Various forms of eyepieces are used instead of the single convex lens in order to obtain greater magnification without the defects of aberration.

Galileo's T. is the prototype of modern opera-glasses. The astronomical T. produces an inverted image; this is immaterial for astronomical observations, but it renders the instrument useless for terrestrial work. The simple pattern of the Galilean T. is shown in Fig. 2. The objective ( $O$ ) is a convex lens of comparatively long focal length, and the eye-

designed the first reflecting T. on the lines shown in Fig. 3.  $M$  is a concave mirror of large radius of curvature; its principal focus is at  $F'$ . Light from a distant star is reflected at  $M$  and the reflected beam converges towards  $I$ , a point vertically below  $F'$ . A plane mirror  $m$  inclined at  $45^\circ$  to the axis of the instrument intercepts this beam and the real image is formed at  $f$ . This image is viewed by the eyepiece and the final image seen by the observer is a virtual one at  $I'$ .

All subsequent reflecting Ts. were modifications of Newton's, a famous one being

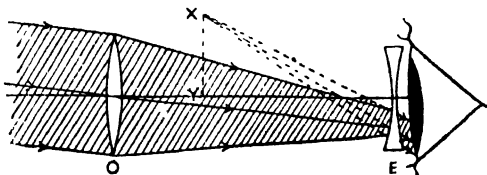


FIG. 2. PRINCIPLE OF GALILEAN TELESCOPE

that of Herschel, the great Brit. astronomer of the eighteenth century. The 100-in. T. of the Mt. Wilson Observatory, the second largest instrument to-day, is a reflecting T. The mirror instead of being truly spherical is 'parabolised' in order to avoid the aberration of a spherical mirror and it is silvered on its front surface by a process of chemical deposition. In this way the silver can be renewed whenever desired. Within comparatively recent times the mirrors of reflecting Ts. have been aluminised instead of silvered, and better results have been obtained.

A still larger T. with a mirror of diameter 200 in. is now in operation at Mt. Palomar, California.

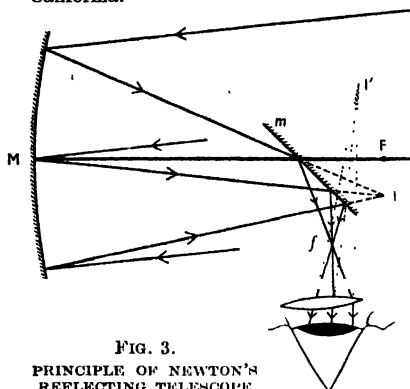


FIG. 3.  
PRINCIPLE OF NEWTON'S  
REFLECTING TELESCOPE

**Brightness of Objects.**—In no case can objects such as the moon or sun appear brighter through a T. than they do when viewed by the naked eye, and if the losses of light by reflection or refraction are taken into account, the apparent brightness of such objects is actually diminished when viewed through a T. But this statement does not apply to the case of stars, whose apparent size is so small that diffraction effects are produced (see below). Under the best conditions the apparent brightness of stars viewed through a T. varies directly as the square of the diameter of the objective, and with the largest modern Ts. stars appear about 100,000 times as bright when viewed through the instrument. As the brightness of the sky is not increased it is possible to view stars in daylight.

**Resolving Power.**—A star seen through a T. appears as a central bright disk of light which is surrounded by alternate dark and bright diffraction rings. Two stars can be recognised as distinct stars, provided that the centre of the bright disk of one falls on the first dark ring of the other. If the stars are closer than this they cannot be distinguished as separate stars; if further apart, they are the more easily distinguished. The limit mentioned is known as the limit of resolution. It can be shown that the angle subtended at the centre of the objective by two stars that can just be resolved is  $1.22 \frac{\lambda}{D}$ , where  $\lambda$  is the wave-length of the

light and  $D$  is the diameter of the objective. Hence the greater  $D$  is, the greater the resolving power of the T.; in point of fact, the above fraction is adopted as the quantitative measurement of the resolving power of a T. The Yerkes T. can resolve two stars that subtend an angle of only  $\frac{1}{2}$  sec. of arc at the centre of its objective. Michelson (q.v.) invented a form of interferometer (q.v.) attachment

to the Mt. Wilson T. that increased the resolving power of the instrument severally times and made it possible to measure directly the angular diameters of some of the larger stars.

In astrophysical research a spectrometer attachment replaces the ordinary eyepiece, while permanent records are obtained by means of a spectrograph attachment, whereby the spectra are photographed. Cameras are fitted to Ts. in all observatories, as it is possible to obtain prolonged exposures of any part of the heavens by means of a clockwork arrangement that keeps the instrument directed to a given area of the sky. Photographic records taken in this way reveal much more information than may be obtained by ordinary visual observation.

See G. Calver, *Hints on Silvered-Glass Reflecting Telescopes*, 1877; A. G. Ingalls, *Amateur Telescope Making* (4th ed.), 1935, and *Amateur Telescope Making, Advanced*, 1937; and H. J. Cooper (ed.), *Scientific Instruments* (chap. ix.), 1946; also T. E. R. Phillips and W. H. Steavenson, *Splendour of the Heavens*, 1923 (chapters xx. and xxi.), and most textbooks on astronomy.

**Television** is the name given to the science which enables pictures or scenes to be transmitted by line or radio (q.v.), and to reproduce them in pictorial form at some point remote from that at which transmission took place.

**History.**—The earliest practical demonstration of T. was given by J. L. Baird before the Royal Institution in 1926. In 1928 the Brit. Broadcasting Corporation experimented with the transmission of still pictures, using the 'fultograph,' and in the same year Baird transmitted a low-definition picture by radio to the U.S.A. In 1929 Baird commenced an experimental low-definition service from the Crystal Palace, and in Aug. 1932 the B.B.C. conducted tests in conjunction with the Baird Company, using a thirty-line system radiated from the Brookman's Park station. The postmaster-general appointed a Television Advisory Committee in 1934 to determine and advise which system should be followed for a public service. They recommended the abandoning of low-definition T., and accordingly, in Sept. 1935, the B.B.C. transmissions ceased.

The first high-definition T. service in the world began in Nov. 1936 with the opening of the B.B.C.'s station at Alexandra Palace. Two separate systems were first tried on alternate weeks: the Baird system of 240 lines and the Marconi E.M.I. system of 405 lines, and these continued until Feb. 1937, when the Baird system was discontinued in favour of the other which is still used. Improvement of this system continued steadily until 1939, when the service was discontinued at the outbreak of the Second World War. In Sept. 1943 the Hankey Committee recommended the restarting of the pre-war service, and in Oct. 1945 the gov. accepted this recommendation so that the Alexandra Palace service restarted on

June 7, 1946. No immediate extension of this service took place until Dec. 17, 1949, when the first relay station at Sutton Coldfield, near Birmingham, was completed. Programmes were still originated in the London studios at Alexandra Palace and were transmitted to Sutton Coldfield either on ultra high frequency radio link or by coaxial cable. Future plans involve the construction of additional relay transmitters, first at Holme Moss near Huddersfield, then in Scotland, and followed eventually by a further station to cover the S.W. of the country. The limited studio space in London was supplemented by the acquisition of the Lime Grove studios at Shepherd's Bush, transmissions from which began on May 21, 1950.

**Service in Great Britain.**—The Alexandra Palace T. transmitter radiates a vision signal on a frequency of 45 Mc./s. (6.67 metres) and sound on 41.5 Mc./s. (7.23 metres), which have an average range of 50 m. The power used is 17 Kw. for vision and 3 Kw. for sound, using double side-band amplitude modulation (q.v.), and the aerials are mounted on a 300-ft.-high tower at Alexandra Palace, which is itself 306 ft. above sea level. In this way the maximum ground-wave range is attained. Sutton Coldfield employs 61.75 Mc./s. (4.86 metres) for vision, using a type of single side-band (vestigial side-band) modulation which confines transmission to the carrier wave and lower side-band, thus keeping to a minimum the band width required. Sound is transmitted on 58.25 Mc./s. (5.15 metres) with amplitude modulation. The vision transmitter has a power of 35 Kw. with 12 Kw. for sound, the aerials being carried on a mast 750 ft. high. The station itself is situated on high ground (550 ft. above sea level), so that an appreciably larger service area than that of Alexandra Palace is obtained. Good signals are received up to 70 m., and in certain directions this range is exceeded. Tests by the radio industry and retailers will show which station gives the better signal, and as only one programme is radiated, no switching facilities from one to the other are required.

**Scanning.**—Just as it is impossible for the human eye to transmit the substance from a page of print instantaneously, so is it impossible instantaneously to transmit a T. image. In the first case the reader must, with his eye, break up the page into words and letters, transmitting these to his brain in a continuous flow. The eye, starting at the left of the page on the top line, travels smoothly to the right, from where it jumps quickly to the left again at the beginning of the next line, and so on until the end of the page is reached. The subject-matter to be 'televised' is treated in much the same way; that is to say, it is scanned electrically, the resulting signals being transmitted for subsequent reconstitution at the receiver into an image which can be seen by the human eye. The scanning process takes place first at the transmitter where the image is broken down,

and second at the receiver where the cycle follows that at the transmitter and is synchronised with it. This is accomplished by means of special synchronising signals which are transmitted with the picture.

**Scanning for Transmission.**—The scene to be transmitted is projected by means of a suitable lens arrangement in the T. camera on a flat rectangular plate suspended within the camera tube itself (see VALVES). The surface of this plate is composed of a mosaic of photo-electric silver-caesium cells, each of which is microscopic in size and separated by an insulating film from a metal back plate. When the image is projected on this mosaic, each cell takes up an electric charge proportional to the light intensity falling upon it, so that the surface carries an electrical 'picture' of the image focused upon it. An electron gun assembly, similar to that of a cathode-ray tube (see VALVES), projects a stream of electrons towards the mosaic. This stream is deflected by suitable time bases (see OSCILLOGRAPH), so that it scans the whole surface of the plate in the manner discussed earlier. As the beam passes over each cell it is discharged, transmitting to the back plate an impulse equivalent to the charge on the cell. In this way the output from the camera tube is an electrically varying current which represents, line by line and frame by frame, the make-up of light and shade in the picture.

**Scanning at the Receiver.**—The early thirty-line receivers employed a rotating Nipkow disk, with holes punched in the periphery so that they formed a spiral in one revolution of the disk. They were so arranged that each adjacent hole scanned a separate line of the picture, but with the advent of high-definition T. such an arrangement became impossible. Scanning at the receiver is carried out by the moving electron beam in the cathode-ray tube, which is deflected in

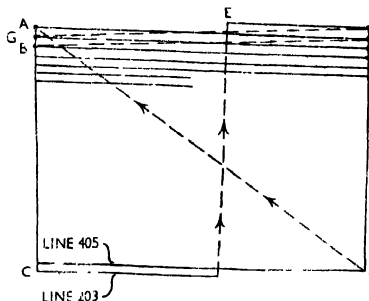


FIG. 1. 'RASTER' FORMATION SHOWING INTERLACE

Typical fly-back lines are shown dotted.

synchronism with that in the camera tube. Two time bases are used, the horizontal one being called the 'line time base,' and the other, which causes vertical

deflection, 'the frame time base.' These time bases operate in exactly the same manner as those in an oscillograph (*q.v.*). The frequency of the line time base for the Brit. T. system is 10,125 cycles per sec., which means that 405 oscillations are completed each  $\frac{1}{40}$  sec. While this is taking place the frame time base applies its deflecting voltage at right angles to the horizontal lines drawn on the tube by the line time base. The frequency of the frame time base is 50 cycles per sec., so that during one complete oscillation the line time base only completes  $202\frac{1}{2}$  lines. At the centre of the 203rd line the downward motion of the beam ceases and the

the end of a line, the lines composing the second half frame will fall between those of the first half frame so that the full frame is made up of two interlaced halves. This is done in preference to a single frame of 405 lines sequentially scanned, as it reduces the apparent flicker of the repeating frames with no corresponding increase in channel width. The completed rectangle so reproduced on the face of the cathode-ray tube is called the *Raster*.

*The B.B.C. Television Wave Form.*—The transmitted T. signal must contain all the elements necessary to enable the picture to be reconstituted at the receiver.

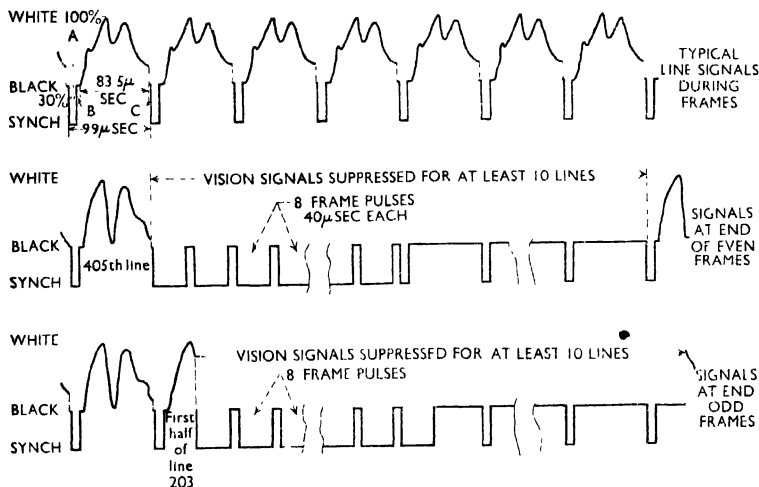


FIG. 2. B.B.C. TELEVISION TRANSMITTED WAVE FORM

A, 10  $\mu$  sec. ; B, 5  $\mu$  sec. ; C, 0.5  $\mu$  sec.

frame time base cycle starts again, so that a further  $202\frac{1}{2}$  lines are completed, but interlaced with the first  $202\frac{1}{2}$ . This gives a completed picture of 405 lines in  $\frac{1}{40}$  sec., which is the present Brit. standard. Reference to Fig. 1 will enable this process to be understood more easily. The fluorescent spot caused by the electron beam starts at A and travels to A<sup>1</sup>, when the line synchronising signal returns it quickly to B, whence it draws the second line to B<sup>1</sup>. Simultaneously the frame time base is causing it to travel down the screen so that each successive line is parallel to the one before. At C (the beginning of the 203rd line) only half the line is drawn, for at D the frame synchronising signal returns it to E, from where the remainder of the 203rd line is finished at F, and line 204 starts at G. The 405th line is finished at H, when another frame synchronising pulse returns the beam once more to A. It can be seen that, because the frame time base is re-started at E in the middle, instead of at

Both line and frame synchronising signals are essential to ensure that the receiver time bases are in step with those of the camera tube. The actual picture signal accompanying these must be capable of transmitting all the details of light and shade present in the camera, and in practice frequencies up to 3 Mc./s. must be transmitted to give approximately equal definition in the horizontal and vertical directions. Positive modulation is used such that peak 'white' in the picture is represented by a 100 per cent modulation of the carrier, 'black' by 30 per cent  $\pm$  3 per cent, with the intermediate shades in between. Between zero and 30 per cent is used for transmitting the synchronising signals (often called synch pulses), which, being 'blacker than black,' do not appear on the *Raster*. Reference to Fig. 2 will show, in graphical form, how these signals are disposed, relative to each other, in the final wave form.

The line pulses are of 10 microseconds duration, separated from the picture



wave form itself by a blank period of 5 microseconds in front and 0.5 microseconds behind. Frame pulses are 40 microseconds long, such that the frame and half-frame synchronising signals are made up of eight such pulses separated by 10 microsecond intervals. To accommodate the frame and half-frame signals described, at least ten lines of the *Raster* are suppressed at each half-frame, so that a 405-line picture possesses 385 active lines of picture material, i.e. lines 1 to 4 are occupied by eight frame pulses, the following six to ten lines being 'black,' separated simply by the usual line pulses, and then the picture lines begin. At

the lines of the *Raster* appear on the tube screen, but these are focused on the film in the gate behind which a photo-cell picks up the light passing through the film as the flying spot on the scanning tube builds up the *Raster*.

*Other Television Systems.*—It is clear that a number of conditions must be specified in order to define the wave form used in a T. system. Although Great Britain was the first country to inaugurate a public high-definition service, there are now others with projected and existing T. stations, chief among the latter being the U.S.A., where many are on daily schedules. The Amer. wave



THE  
TELEVISION  
SCREEN

A photograph taken direct from a 10-in. tube, showing the degree of fine detail which is attainable. The lines of the *Raster*, hardly visible in the original photograph, are lost in the half-tone screen necessary for printing. The reproduction is one-third of the actual size.

Emtron Television  
Ltd.

202½ lines the frame pulses are repeated, interlace is effected, and the remainder of the *Raster* is built up to give the completed picture. The ratio of height to width is 3:4.

*Film Scanners.*—Increasing use of cinematograph film is being made in compiling T. programmes to-day. For this purpose special film projectors known as 'scanners' are used. Early models consisted merely of a standard ciné projector, in front of which was set up a T. camera. The arrangement was not entirely satisfactory, due in part to the troubles associated with synchronising the projector frame frequency with the T. camera frame frequency. Modern film scanners have been developed especially for T. transmission in which the film moves through the 'gate' at a constant speed, and scanning is accomplished by means of a 'flying spot' scanner. The latter, in its simplest form, produces a *Raster* on the screen of a special cathode-ray tube operated to give a very bright image. Nothing except

form differs from the Brit. in sev. respects, and has the following chief characteristics. Negative modulation is used to transmit an interlaced picture of 525 lines and thirty frames. The accompanying sound is broadcast, using frequency modulation (*see* MODULATION). The Netherlands Philips Company operate an experimental system at Eindhoven similar to the Amer. but of 625 lines and twenty-five frames, while the Fr. favour 819 lines and twenty-five frames. Sev. attempts have been and are being made to reach an agreed standard for Europe, so that programmes can be exchanged internationally. To do this it is essential that the number of lines and frames be the same even if the direction of modulation is different, as the latter can be converted for relay purposes. A figure of 625 lines and twenty-five frames has been looked on with some favour, although the Fr. have since decided to proceed with a service on 405 lines, similar to that in Great Britain.

*Receiving Aerials.*—Unlike domestic

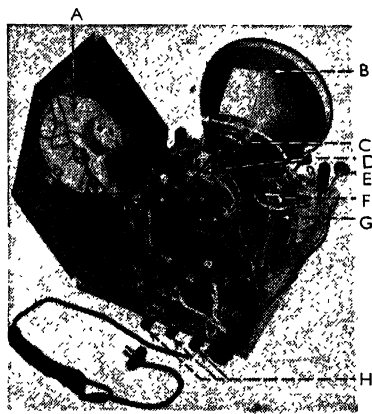
radio receivers, which will operate satisfactorily with a simple length of wire for an aerial, T. sets require something more elaborate for the best results. Because the wave-length for any T. station is relatively short a resonant aerial becomes possible, and this usually consists of a half-wave aerial made of light alloy or steel tube, and fed at the centre with low impedance coaxial or balanced cable. Greater gain is obtained if a reflector element be added, and quite complicated arrays are used in areas of weak signal strength (see BEAM WIRELESS). These aerials are mounted either vertically or horizontally to conform with the polarisation of the transmitting aerials. Tubing is used for the elements, since an aerial made of wire would be too sharply resonant with resulting loss of band width, and therefore poor picture definition. In the U.S.A., where a number of stations are available to the viewer, sev. aerials may be necessary, both because of the different frequencies used and because each aerial receives from a different direction.

**Receivers.**—Receivers (see RADIO RECEIVERS) used for broadcast reception are of two main types, namely, tuned radio frequency (T.R.F.) and 'superhet' (super-heterodyne), of which the latter is more common. T. receivers, too, exist in both varieties, and the tendency is also to favour the superhet. Their main characteristics are that they should have sufficient sensitivity; the band width accepted should be wide enough to reproduce all the picture detail; the time bases should lock easily and not respond to impulsive interference; both vision and sound channels should also discriminate against such interference; and, finally, the picture should be sharply focused and bright, with correct grading of half-tones. It must be remembered the eye is far less tolerant of poor reproduction than the ear, and therefore a high standard of receiver performance is called for compared with a broadcast set.

As its name implies, the T.R.F. receiver is one which accepts the vision and sound signals at their carrier frequencies and amplifies them directly. Separate channels are usually used for sound and vision, following a common radio frequency (R.F.) amplifier (see VALVES), and each has its separate detector. After detection the receiver operation becomes identical with that of the superhet. More stages of amplification are necessary than in a broadcast set, partly because the gain per stage is lower at the higher carrier frequency used, and partly because a much wider acceptance band is essential (as explained earlier).

In a superhet receiver the first valve is invariably an R.F. amplifier, like its T.R.F. counterpart, accepting both sound and vision channels. Next follow one, or in some cases two, mixer valves, but only one oscillator is used. This oscillator beats with the sound and vision carriers to give two intermediate frequencies (I.F.), which are then fed to separate I.F. amplifier valves. The vision I.F. con-

taining one, or both side-bands, may have two or three such valves, while the sound, by virtue of the narrower band width, is sufficiently amplified by one or two only. The sound-channel is treated in exactly the same way as in the conventional broadcast set, but the range of musical notes that it reproduces is somewhat greater than for medium-wave broadcasting. The vision (or 'video') signal is detected, amplified, and passed to the electrode of the cathode-ray tube which controls the intensity of the beam, and hence the light and shade of the picture. At the same time, the processes of 'sync separation' and 'D.C. restoration' are performed. The sync separator carries



Philips Electrical Ltd.

CHASSIS OF MODERN TELEVISION RECEIVER, SHOWING CATHODE-RAY TUBE, VALVES, AND MAIN COMPONENTS

A, loudspeaker; B, cathode-ray tube; C, deflection coil assembly; D, focus coil; E, one of four main control knobs; F, I.H.T. rectifier; G, line output transformer; H, time base pre-set controls.

out the very necessary function of removing the synchronising signals from the video signal existing after detection discriminating between line and frame signals, and passing them to their respective time bases. The D.C. restorer sets the 'black level' of the tube at zero potential, and by fixing it ensures that the video signals above 'black' in the picture are positive. The cathode-ray tube itself may have a face diameter of anything from 9 to 15 in., on which the picture of ratio 3 : 4 is reproduced. In addition to the normal voltages common to other valves in the receiver a source of 'extra high tension' is necessary, which may be between 5 and 10 Kv. in a domestic receiver. Early sets had a high voltage secondary winding added to their mains transformers to produce the extra high tension (E.H.T.) required, but the resulting transformer was heavy and the reliability in some cases was bad, besides

being dangerous to the unwary service engineer. Most present-day receivers employ one of two other systems for E.H.T. generation. The first of these, 'line fly-back,' makes use of the fact that, on the horizontal return stroke of the beam, a very rapid change of current takes place in the winding of the line transformer which, possessing appreciable inductance, opposes this change so that a very high-voltage pulse appears across it. This pulse can be rectified, voltage doubled or trebled, smoothed and used for the final anode of the cathode-ray tube. The second employs a separate R.F. oscillator having a sinusoidal wave form, which after amplification is passed through a peak rectifier, and thus the necessary K.H.T. is obtained.

*Big Screen Receivers and Projection Television.*—Pictures reproduced by direct-viewing receivers have always

which is 2½ in. in diameter; it is reflected by spherical mirror D to the plane mirror E through which the tube projects. Interposed between E and the second plane mirror G is a weak lens or 'corrector plate' which counteracts the spherical aberration introduced by D. The picture JK is reproduced by back projection on the screen H; 25 Kv. at 100 micro-amperes are used for the final anode of the tube, whose screen is aluminium backed to give an intense black-and-white picture. Fig. 3 shows the optical unit from which the tube neck projects surrounded by (but not shown in the diagram) the focus and deflection coils. The picture possesses good brilliance, excellent tone gradation, and is almost independent of ambient light in front of the screen. Economically the system has much to recommend it since tube replacement costs are low, and the initial outlay

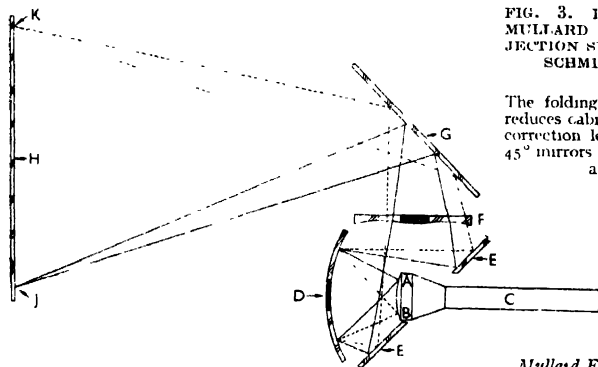


FIG. 3. DIAGRAM OF THE MULLARD TELEVISION PROJECTION SYSTEM, USING THE SCHMIDT PRINCIPLE

The folding of the optical path reduces cabinet dimensions. The correction lens between the two 45° mirrors corrects the spherical aberrations

*Mullard Electronic Products Ltd.*

tended to compare unfavourably with home cinema pictures with which they are inevitably classed. For this reason development of big screen reproduction has engaged T. engineers for many years. Before the Second World War at least two Brit. manufacturers did demonstrate such pictures successfully. The more remarkable of the two was that produced by the Scopony Company, using high-precision mechanical scanning to give a bright picture which was projected on a cinema screen. The mechanical scanner, however, was very expensive and required skilled operation.

Projection T. is the system whereby pictures are thrown by optical means from the face of a small cathode-ray tube on to a much larger screen. Early attempts used projection lenses, but they lacked sufficient brilliance. A more recent development, an example of which is the Mullard projection T. system, makes use of a Schmidt mirror lens arrangement. The light-path is 'folded,' as shown in Fig. 3, so that the whole assembly becomes compact enough for inclusion in a domestic receiver cabinet. The picture is produced at AB on the tube face C,

becomes an economic proposition for picture sizes larger than those having a 15-in. diagonal.

*Colour Television.*—Like the cinema, T. is always striving for improvement of the monochrome picture by the addition of colour, and a number of colour systems have been demonstrated. J. L. Baird was an early pioneer in this direction, and one of the first techniques developed employed a system whereby the normal frame frequency was increased by a factor of 3, each successive frame containing the material for one primary colour. The receiver used revolving colour disks in front of the viewing screen, synchronised with the correct frame colours at the camera. A similar system replaced the colour disks by three superimposed projected pictures corresponding to the three primary colours. These systems are expensive, both in equipment costs and also the frequency spectrum required, but in 1949 the Radio Corporation of America produced a six megacycles compatible high-definition colour T. system which, it is claimed, requires no wider frequency band than for a monochrome picture, and enables standard monochrome

receivers to accept the same signal without modification.

In view of the high cost it is likely to be a number of years before colour T. can provide a public service. Its main use is on closed wire circuits, e.g. in a teaching hospital where a camera over the operating table can transmit images in full colour to a number of receivers located at a remote point where students can follow in close-up detail the operation being performed.

See M. G. Scroggie, *Television*, 1935; A. W. Keen, *The Principles of Television Reception*, 1949; M. Gorham, *Television*, 1949; British Broadcasting Corporation, *The BBC Television Service: a Technical Description*, 1950; and J. Swift, *Adventure in Vision*, 1950.

**Telford, Thomas** (1757-1834), Scottish civil engineer, b. at Westerkirk, Dumfriesshire, son of an Eskdale shepherd, and apprenticed to a local stone-mason when fourteen years old. He went to Edinburgh in 1780, and to London and Portsmouth in 1784. T. built the Severn bridges at Montford and Buildwas, 1793-1796; the Ellesmere Canal, 1796-1801; the Caledonian Canal, 1801-23, and in the same period over 1000 m. of road and 1200 bridges throughout Scotland. His greatest achievement was the improvement of the London-Holyhead road with the building of the Menai suspension bridge. He also did much harbour work in Scotland; he built St. Katherine Dock, London; the Gotha Canal, Sweden; and designed the Warsaw frontier road for Tsar Alexander. A man of talent, wholly self-educated, T. often gave his services gratuitously. He was one of the founders of the Institute of Civil Engineers (1818), and was its first president. He is buried in Westminster Abbey. His autobiography was pub. in 1838. See A. Gibb, *The Story of Telford: the Rise of Civil Engineering*, 1935.

Tel Jezar, see GZER.

**Tell, William**, national hero of Switzerland. The story in the form which first appears in a chronicle written between 1467 and 1476 would appear to be largely legendary, but sev. Swiss critics suggest that T. did really live, and that he may have played some part in the rising of the Inner Cantons against the tyranny of the Hapsburgs at the beginning of the fourteenth century, though his importance has been greatly exaggerated in the legends that remain, and his real character has been obscured by a confusion with old folk-themes. The prin. source of the life and deeds of T. is the *Chronicon Helveticum* of Aegidius Tschudi (1505-72), which is even more embellished. From this Schiller took his drama *Wilhelm Tell* (1804). The story centres on the struggle for independence of the cantons Schwyz, Uri, and Unterwalden, and is as follows: T. having refused to do homage to the cap which Gessler, the Austrian governor, set up for the purpose in the market-place of Altdorf, was taken prisoner, and on being brought before the landgrave was promised his liberty if he could cleave an apple in twain, placed on his son's head, at the distance of eighty paces. He accomplished the task, but confessed on

compulsion that the other arrow in his hand was meant for Gessler's heart had he failed, whereupon he was again seized and taken on the lake en route for Kussnacht Castle. But a storm having arisen, T. was asked to steer the ship, and while doing so effected his escape. He sprang ashore, pushing the boat back from the shore by his spring, an incident which has given its name to a place, the Tellsprung. He afterwards killed the landgrave, and his actions became symbolic of the courage of the Inner Cantons in their struggle against the Hapsburgs. See F. Schiller, *Wilhelm Tell* (trans. by A. Latham, Temple Classics). See also P. Lang, *Die schwarze Tellspralle*, 1924; F. Gropengießer, *Wilhelm Tell in der schweizer Geschichte*, 1940; K. Meyer, *Der Ursprung der Eidgenossenschaft*, 1941; R. Labhart, *Wilhelm Tell als Patriot und Revolutionär*, 1947.

**Tell**, see under ALGERIA; TUNIS.

**Tell el-Amarna**, see TEL AL-AMARNA.

**Tellers of the Exchequer**, see TALLY.

**Tell es-Säfi**, see under GATH.

**Telley, Gabriel**, see TIRSO DE MOLINA.

**Tellez, Balthazar**, see under GALLAS.

**Tellurium** (symbol Te, atomic weight 127.6, atomic number, 52), rare element of the sulphur group. It occurs in the free state in nature, but is chiefly obtained in combination with other elements, as in tellurite (TeO<sub>2</sub>) and tetradyte (Bi<sub>2</sub>Te<sub>3</sub>). It is a bluish-white solid with a metallic lustre (melting-point 452° C.; sp. gr. 6.26). T. forms tellurides with hydrogen and the metals, corresponding to the sulphides. Two oxides, the dioxide and trioxide, are known, which give rise respectively to the two acids, tellurous acid and telluric acid.

**Tellus**, see GAEA.

**Telpher**, see under MONORAIL.

**Telugu**, Dravidian language spoken in the central and E. portions of S. India. It may be said that Telugana ('Teluguland') stretches roughly N. from Madras to the borders of Orissa and N.W. to Bellary, where T. meets the Kanarese. Of all the Dravidian languages, T. is spoken by the largest number of people, about 22,000,000. It is strongly admixed with Sanskrit.

**Teme**, riv. of Great Britain. It rises in Wales, and flows through Shropshire and Worcestershire, to join the Severn near Worcester. It is 60 m. in length.

**Temesvar**, or **Timisoara**, as it is now called, city of Rumania, on the Bega. It is the cap. of the Banat. It is strongly fortified, and is the see of a Rom. Catholic bishop and of a Gk. Orthodox bishop, with a fine cathedral and a castle. It is now an industrial centre. Manus. include textiles, brewing and distilling, chemicals, leather, and shoes. Its univ. was founded in 1945. Pop. 110,000.

**Tempera**, or **Fresco Secco**, see under FRESCO PAINTING; MURAL DECORATION.

**Temperance**. The recognition of the social, moral, and physical evils which may be directly or indirectly traced to the excessive consumption of alcohol is of comparatively recent origin. The attitude of civilised mankind on this subject

has undergone change within the last century. The more critical attitude adopted has been accompanied by widespread constructive endeavour towards the abatement of intemperance on the part of numerous organisations and individuals. It can now be generally assumed (1) that the occasional drinking and total numbers of the pop. have steadily increased; (2) that the heaviest drinking occurs chiefly among those engaged in heavy industry or with no regular occupation, using alcohol as a means of escapism from poverty, unemployment, and illness. The *per capita* consumption has fallen from 33 gal. annually to 13.5 gal. during the period from 1875 to 1948 with respect to beer, and from 1.3 gal. to .20 gal. with respect to spirits. During the nineteenth century various computations gave intemperance as the chief cause of the major social evils, some authorities placing the proportion as high as 75 per cent. A more intelligent examination of records by skilled investigators yields a more moderate figure, especially as regards intemperance as a direct cause. After careful analysis, it has been found that intemperance was responsible only for 14 per cent of cases of destitution, and the modern point of view among publicists may be expressed, in terms of psychology, that people drank because they were poor, not that they were poor because they drank. On the other hand intemperance is still regarded as being a potent cause of 'secondary' poverty. According to the Lunacy Commissioners' tables, about 10 per cent of cases of lunacy are directly attributable to excessive drinking. That alcoholism is responsible for crime is acknowledged, but there does not appear to be sufficient evidence to support the allegation that excessive drinking is the cause of major crimes other than suicide, since forgery, theft, and crimes of violence require good physical condition in the person of the perpetrator.

The prin. existing means adopted since the origination of the T. movement in 1826 may be conveniently classified into: (1) prohibition and local option; (2) the Scandinavian company system, which places the control of the sale of liquor in the municipality, the profits to be utilised for public purposes; (3) state monopoly of municipal control; (4) the institution of counter attractions; (5) high licence; (6) taxation of liquor. Prohibition (*q.v.*) was tried in the U.S.A. and other countries, and involved the suppression of the buying and selling of liquor within the ters. concerned. Eng. T. organisations have, with but few exceptions, never favoured prohibition, except as a long-term policy, but are for the most part strongly in favour of local option (*q.v.*). Under the Scandinavian company system, called the Gothenburg system, the liquor traffic was controlled by companies to whom the municipal authorities transferred all liquor licences (*see further under LOCAL OPTION*). In Sweden in 1919 the Bratt system replaced the Gothenburg system, by a charter of the Stockholm City Council, and

control rests in the hands of a central trade organisation subject to a royal board of control. Moreover it became necessary for the individual consumer of spirits to take out an official permit or *matbok*, wherein a record is kept of his purchases. These must not exceed the prescribed quantity per month. Finland, like the U.S.A., had an absolute prohibition law adopted in 1919. An advisory national plebiscite was held in Jan. 1932, a great majority voting in favour of abolition of prohibition. The Parliament thereupon set about passing a law permitting the sale of all liquors, but under a state-controlled monopoly. The system of state monopoly was adopted in tsarist Russia. The Soviet Gov. abolished on-consumption of spirits in the state drinking premises, and made many other stringent provisions against public inducements to tipping, and it has also been effective in reducing intemperance in a country which was overrun with the evil. For a time the most promising 'solution' of the drink problem was considered to lie in the direction of the municipal control of the drink traffic, but experiments along these lines have not been wholly successful, particularly when they have been divorced from any democratic control by local option. Opponents of public ownership contend that the mere transfer of the vested interest from private to public ownership does not necessarily improve sobriety. They maintain that it simply confers a civic dignity upon the trade in intoxicants. Prominent supporters of T. include Father Mathew, Cardinal Manning, Archbishops Frederick and Wm. Temple, Lord Snowden, and Lady Astor. *See T. N. Carver, Government Control of the Liquor Business*, 1919; M. E. Tydings, *Before and after Prohibition*, 1930; G. E. G. Catlin, *Liquor Control*, 1931; G. B. Wilson, *Alcohol and the Nation*, 1940; and H. C. Heath, *The Control of a Dangerous Trade*, 1947.

**Temperature:** 1. In physics, the condition of a body on which its power of transferring or receiving heat (*q.v.*) from another body depends. The sensation of touch gives no accurate knowledge as to whether one body is hotter than another. To obtain this one of the other effects which heat produces on matter is employed. The effect generally made use of is, that most substances, when heated, change in size, and in gases the change is proportional to the change in T. over a very large range. The liquid mercury is, however, generally adopted, its expansion being nearly proportional to the change in T.; thus most thermometers contain this liquid, the T. being indicated by the measurement of the volume of mercury contained. Alcohol is used for the measurement of low Ts. owing to its low freezing-point, but is of little use for high Ts. owing to its low boiling-point. The most accurate thermometer is the gas thermometer. *See further under THERMOMETER AND THERMOMETRY*. For absolute T., *see GAS AND GASES; PYROMETER*.

2. **Body Temperature.**—The T. of the

body varies with the different forms of life. In man it lies between 98.4° F. and 99.5° F. in a state of health, and between these limits there are slight variations due to the amount of exercise, ingestion of food, the T. of the surrounding atmosphere, etc. In the cold-blooded animals the Ts. have a wider range and are much lower than in the human family. Thus the T. of the frog may vary from 63° F. to 48° F., according to circumstances, and that of the python, about 76° F.; may be higher when the female is coiled around her eggs. It is not always easy to draw a hard and fast line between the cold-blooded and warm-blooded animals; hibernating animals like the dormouse, hedgehog, and others resemble cold-blooded animals during their winter sleep. Some of the mammals which are born in a state of immaturity (naked and blind like rabbits and rats) bear a resemblance to cold-blooded animals. There are small fluctuations in T. in human beings during the day; it reaches its maximum during the afternoon and evening, from about 4 p.m. to 9 p.m., and a minimum in the morning hours, from about 1 a.m. to 7 a.m. The source of animal heat is due to the oxidation within the tissues of the body, and different foods have different values as heat producers. The almost uniform T. of the body is maintained by a process of adjustment, superfluous heat being eliminated by different means, the lungs and skin playing a major part in this process.

3. *Air Temperature* varies appreciably with time, but, in any one place, the mean T. over an interval of, say, ten minutes changes only slowly and can be measured approximately by a thermometer which has a short time-lag, shielded from radiation in a Stevenson screen or whirled through the air (see further under METEOROLOGY). A detailed record of this 'mean' T. throughout the day can be obtained by using a thermograph (*q.v.*), but a rough idea may also be obtained by using maximum and minimum thermometers in addition to reading an ordinary thermometer at fixed times. Ts. in the upper air are measured by instruments attached to aircraft, or supported by kites or kite balloons or, more frequently nowadays, by radio-sonde (*q.v.*). Since the air near the surface is warmed or cooled by contact with the earth's surface, the daily maximum usually occurs in the early afternoon when the outgoing earth's radiation just begins to balance the incoming solar radiation which has warmed the earth's surface in the first place. The daily minimum T. usually occurs about dawn when the sun's radiation begins to warm the earth's surface again. Near the earth's surface, the highest observed T. is 136° F. at Azizia, Tripoli, Sept. 13, 1922, and the lowest, -93.6° F. at Verkhoyansk, Siberia, Jan. 3, 1885. In the Brit. Isles the highest is 100.5° F. at Tonbridge, July 22, 1868, and the lowest, -17° F. at Braemar, Feb. 11, 1895. For more detailed figures of air T. see CLIMATE.

**Tempering**, heat treatment process for

relieving certain stresses that may occur in hardened steels, and for recovering to specific limits the hardness and ductility essential to hardened steels. A hardened steel that has not been tempered or stress relieved can be brittle and susceptible to cracking. The process itself consists of reheating the steel to a specific temp. and quenching in oil and water or, in the case of air hardening steel, by cooling in air. The oldest and most commonly used method of determining T. temp. is one of observing the surface oxide colour tints that occur whilst the steel is being reheated. These tints indicate with some measure of accuracy the temps. reached. When the appropriate colour change appears the steel is cooled in air, oil, or water. This method calls for extreme skill and experience on the part of the heat treater.

The methods commonly used for heating steels to T. temps. are: (1) by the use of hot cast-iron plates, upon which the parts to be tempered are placed. As soon as the required T. colour appears the parts are quenched in oil or water. (2) The parts to be tempered are placed in a box or tray of clean dry sand and heated upon a fire hearth or forge, and similarly quenched. (3) Baths containing oil, lead, or salt are heated and maintained at exact temps. The parts to be tempered are placed in a suitable basket or cradle and suspended in, or passed through the hot liquid and allowed to cool in air.

Lastly, there are various types of electrically heated and air-controlled furnaces in which the parts to be tempered are heated. The trend in modern methods of T. is to use liquid baths for reheating, and towards the use of pyrometer and thermo-electric control for accurate measuring of T. heats.

**Temperley, Harold William Vazeille** (1879-1939), Eng. historian, *b.* at Cambridge, and educated at Sherborne School and at King's College and Peterhouse, Cambridge. He became a fellow of Peterhouse in 1904. T. frequently visited the Balkans between 1905 and 1909, notably during the Young Turk revolution. In the First World War he served in the Dardanelles campaign. T. had many adventures in Yugoslavia and Hungary (1918-20), where he tried to mediate in the fighting after the armistice. In 1920-1924 he ed. the *History of the Peace Conference of Paris*. T. was recognised as one of the leading modern historians by his work on the *Foreign Policy of Canning* (1925). He collaborated in the production of the *Cambridge Modern History*. With G. P. Gooch he was given the task of editing the Brit. documents relating to the origin of the First World War, which were produced in 11 vols. (1926-38) as *British Documents on the Origins of the War*. From 1923 to 1937 he was editor of the *Cambridge Historical Journal*, and from 1930 was prof. of modern hist. in the univ. of Cambridge. He was president of the International Historical Conference from 1933 to 1938. In 1938 he succeeded Lord Birdwood as master of Peterhouse. T. was considered an authority on Brit. foreign policy since 1815.

**Tempest, Dame Marie** (1866-1942), Eng. actress, b. in London, her real name being Mary Susan Etherington. She was educated at the Convent des Ursulines, Thildonck, Belgium, and studied music in Paris and at the Royal Academy of Music under Manuel Garcia. In 1885 she acted in Suppé's *Boccaccio*. She attracted attention in the title role of the operetta *Dorothy*, which ran for over two years. From 1895 to 1900 she was the leading attraction at Daly's and drew great audiences to such musical comedies as *The Geisha*, *San Toy*, *A Greek Slave*, and *An Artist's Model*. She then abandoned the musical stage until 1924, when she sang in Clifford Bax's *Midsummer Madness* at the Lyric, Hammersmith. Her change to 'straight' acting proved immediately triumphant. She began with historical and romantic comedy, appearing as Nell Gwynne and Peg Woffington, following these with Becky Sharp and Polly Eccles. Her technique was artificial, yet an ideal medium for the expression of caprice and waywardness in light comedies. Her chief parts in this type were in *The Marriage of Kitty* and in Arnold Bennett's *The Money-moon*. She had a series of successes in Somerset Maugham's epigrammatic comedies, such as *Mrs. Dot* and *Penelope*. As an actress of the mannered style she had no equal during all her later years, and her vivacity was perhaps her outstanding natural gift. She was created D.B.E. in 1937.

**Templars, or Knights Templars**, military order of the Middle Ages, the most famous and powerful of this type, and deriving their name from their armoury adjoining the Temple convent at Jerusalem. They are known also as the Brethren of the Temple at Jerusalem, the Soldiery of the Temple, or the Soldiers of Christ. Like the other military orders the T. owed their origin to the burst of crusading zeal which marked the eleventh and twelfth centuries. The Order of the Templars was founded in 1118 by nine Fr. knights, led by Hugh de Payns, and they received their rule in 1128 from St. Bernard, who was then in the Holy Land. Their original vow was simply to maintain free passage for the pilgrims who should visit the Holy Land. The name that they first took was the Poor Soldiers (*Pauperes Commilitones*) of the Holy City, and they professed to have no source of subsistence but the alms of the faithful. Pope Honorius II. confirmed their rule and assigned a white mantle as their badge. Pope Eugenius added a red cross on the left breast to the mantle. The standard of the T., *Beauseant* (O.F., a black and white horse), was a red cross on a field striped black and white, and *Brauseant* was the famous war-cry of the order. Their motto was *Non nobis, Domine, non nobis, sed Nomini Tuo da gloriam*; and their seal showed two knights riding one horse. The constitution of the Knights Templars was simple. At the head was the grand master, who was elected by the general body of the knights. Under him was his seneschal or lieutenant; other high officers were the marshal, the

treasurer, etc. The sev. countries in Asia and Europe in which the order had possessions were denominated provs., and each of them was presided over by a resident chief, called a grand prior, grand preceptor, or prov. master. Under the prov. masters were the priors, otherwise called bailiffs or masters, who each had charge of one of the dists. into which the prov. was divided; and finally, under the priors were the preceptors, each of whom presided over a single house or estab., hence called a preceptory. The head prov. was that of Jerusalem, and here the grand master resided till 1187. After this he retired to Acre, and then to Limisso. For more than 170 years the Soldiers of the Temple formed the most renowned portion of the Christian troops, and almost every encounter with the enemy bore witness to their prowess and daring. By 1300 the order had 15,000 members, and its property included 9000 castles and manors. The destroyer of the T. was Philip le Bel of France. He compelled the pope to summon the grand master, Jacques de Molay, to Europe. In 1307, whilst Molay was at Paris, two individuals of notoriously evil character made certain revelations accusing the T. of heresy, idolatry, unbelief, and a number of foul practices. As a result, the order was suppressed at the council of Vienne in 1312, many of its members tortured, and its property confiscated. It continued, however, in Portugal, where it took the new name of the Order of Christ. The name survives in the Temple, London, and the Temple, Paris, etc., and a number of their churches, built in the round style peculiar to the order, still exist. The London Temple Church survived the Second World War with severe damage.

**Temple, Eng. earldom.** Eng. title held by the Grenville family, together with the dukedom of Buckingham and Chandos. The first earl was Richard Grenville (1711-1779), eldest son of Richard Grenville (1678-1728) and Hester T., afterwards Countess T.; succeeded to his mother's peerage in 1752 and took the name of Grenville-T., M.P. (1734). *George Nugent Temple-Grenville* (1753-1813), second son of George Grenville and nephew of the first Earl T., succeeded his uncle as second Earl T. in 1779. He was created marquis of Buckingham in 1784 and was a lieutenant of Ireland. His son, *Richard Temple Nugent Brydges Chandos Grenville* (1776-1839), became first duke of Buckingham and Chandos (created 1822), having married the heiress of the last duke of Chandos, and was M.P. as Earl T. from 1797 to 1813. His son, *Richard Plantagenet Temple Nugent Brydges Chandos Grenville* (1797-1861), was second duke of Buckingham and Chandos (q.v.). His successor, *Richard*, the third duke (1823-1899) was colonial secretary, 1866-68. On his death the dukedom became extinct. His titles of Earl T. and Viscount Cobham passed to relatives. The family seat was at Stowe, near Buckingham. The sixth earl T. of Stowe was born in 1909.

**Temple, Frederick** (1821-1902), Eng. prelate, educated at Blundell's School and

Balliol College, Oxford, where he met and formed a friendship with Jowett, Matthew Arnold, and Clough. T. was ordained deacon in 1846 and priest in 1847. In 1857 he became headmaster of Rugby, where he continued the work of Arnold, though he laid more stress than the latter on the place of orthodox religion in school life. His friendship with Gladstone, whose Liberal views he shared, led to his being appointed in 1869 to the see of Exeter, where he won for himself great popularity by his sincerity and humanity. He was appointed bishop of London in 1885, and in 1896 archbishop of Canterbury. Among the ideals which T. had much at heart was the cause of temperance. He worked hard to prevent the influence of the Oxford movement from resulting in a split within the fabric of Anglicanism. *See* lives by W. F. Aitken, 1903, and E. G. Sandford (ed.), 1906.

**Temple, Henry John**, *see* PALMERSTON, VISCOUNT.

**Temple, Sir William, Bart.** (1628-99), Eng. statesman and man of letters, *b.* in London; studied at Emmanuel College, Cambridge. Travelled in his youth, and in 1655 married Dorothy Osborne (*q.v.*).

**Temple, William** (1881-1944), Eng. prelate, *b.* at the Palace, Exeter; son of Frederick T., and educated at Rugby and Balliol College, Oxford. T. was fellow and lecturer in philosophy at Queen's College, Oxford, 1904-10. He was ordained priest in 1909, and was chaplain to the archbishop of Canterbury, 1910-21. T. was headmaster of Repton School, 1910-1914, and rector of St. James's, Piccadilly, 1914-18. He was bishop of Manchester, 1921-29, and was appointed archbishop of York and a privy councillor in 1929. T. became archbishop of Canterbury in 1942. As a writer, T.'s fame will rest chiefly on his essays in philosophy and on his application of that philosophy to social and economic problems. As a thinker he is considered by some to follow in the line of eccles. thinkers of the calibre of St. Anselm. The two vols. of his *Readings in the Gospel of St. John* (1939), shows his deep devotion. His Gifford Lectures, delivered at Glasgow Univ. while he was archbishop of York and collected under the title *Nature, Man, and God* (1934), are an outstanding contribution to theology. *See* life by F. A. Iremonger, 1948.

**Temple**, structure designed for the worship of a deity or deities. The first *temple* of the Romans was simply the space of earth and sky marked off by an augur for divination. The anc. Egyptians built enormous Ts. by degrees over a long period; anc. India is noted for cave Ts. hewn out of the solid rock; but the most celebrated Ts. of antiquity were those of the Gks. In the Far E. and in S.E. Asia the T. is known as *pagoda*, while the anc. Mexican T. was known as *teocalli*. In France Protestant churches are known as Ts., as also are some Jewish synagogues.

**The Jewish Temple.**—The sacred edifice of the anc. Heb., erected at Jerusalem. It was built on Mt. Moriah, which

was one of the hills of Mt. Zion. *Solomon's Temple.*—The idea of building the T. was suggested to the mind of David, but it was Solomon, his son and successor, who commenced the work in the fourth year of his reign. The building of the T. required seven years. The T., whose building was directed by Phœnician craftsmen, was of imposing character. It is described in detail in the Bible (1 Kings vi., vii.; 2 Chron. iii.-v.) and by Josephus (*Ant.* viii. lii). The rock-altar (see below) is the only remains still preserved. The site of the T. lies to-day within the sacred enclosure of the Muslims known as the Haram esh-Sherif ('The Noble Sanctuary'). The most striking natural feature of the Haram is the anc. rock-altar (a great outcropping of rock measuring 58 ft. by 51 ft. by 4-6½ ft.), known as es-Sakhra ('sacred rock'), and covered by the Kubbet es-Sakhra ('Dome of the Rock'). One can still trace on this rock the channels which conducted the blood to an opening which in turn conducted it to a sacred cave underneath. *The Second Temple* was built, on the same site, by Zerubbabel, and was completed in 516 B.C., seventy years after the first T. was destroyed. It was probably without ornaments, and was as nothing in the eyes of those who had seen the T. in its former glory. *The Herodian Temple* (described by Josephus, *Ant.* xv. xi., and *Wars* v. v., and in the Babylonian Talmud, *Qodashim, Middoth*) was begun in 20-19 B.C., and was finished in A.D. 64, six years before it was finally destroyed. According to Tacitus, it was 'a temple of immense wealth.' The 'Western' or 'Wailing Wall,' (*q.v.*) belongs to the remains of the enclosure-walls of the Herodian T.

*See under* ARCHITECTURE; ATHENS; AZTECS, THE; BUDDHA AND BUDDHISM; EGYPT, *History*; GREECE, *Greek Art*; INDIA, *Indian Art*; JAPAN, *Art*; MAYA; OLYMPIA; PARATHENON; SYNAGOGUE; THEBES; UR; ZIMBARWE.

**Temple, London**, *see under* INNS OF COURT.

**Temple Bar**, former gateway of London dividing Fleet Street from the Strand. When the sovereign visited the city, the custom was to ask the permission of the lord mayor to pass T. B. The old archway was built by Wren in 1670, but was removed in 1878 and was re-erected in Theobalds Park, Cheshunt, Hertfordshire. It is now represented by a monument called the Temple Bar Memorial.

**Tempo** (It. time), musical pace. The speed of any musical composition, determined, not by the note-values used by the composer, which are relative, but by the directions set above the staff at the opening of a piece or section (e.g. *allegro*, *andante*, *adagio*, etc.). These words cannot fix the exact pace required by the composer; this can only be done by means of metronome marks (e.g. ♩ = 96, i.e. 96 crotchets to the minute, etc.).

**Temporal Power**, *see under* PAPACY.

**Temporary Rank**, rank sometimes conferred upon an officer to enable him to command officers senior to him in a certain locality. It only holds good within



the 'command' or country in which it has effect, but therein it has the same advantages of precedence, command, and pay as ordinary rank.

**Temuchin**, *see* GENGHIS KHAN.

**Temuco**, city of Chile, cap. of the prov. of Cantin, 430 m. S. of Santiago and 106 m. N.E. of Valdivia. Cereals, timber, and apples are the main products. It is the headquarters of the S. Amer. Missionary Society. T. is a cathedral city with a pop. of 85,000.

**Tenacity**, *see under* ELASTICITY; STRENGTH OF MATERIALS.

**Tenant**, *see* LANDLORD AND TENANT.

**Tenants in Common**, *see* COMMON, TENANCY IN.

**Tenasserim**: 1. Tn. of Lower Burma on the T. R. 2. Div. of Lower Burma, consisting of a narrow strip of land lying to the E. of the bay of Bengal. There is a heavy rainfall, and where cultivation is possible, rice is grown. Some tin is mined. Cap. Moulm-in. Area 35,886 sq. m. Pop. 2,111,000.

**Ten Brink, Bernard**, *see* BRINK, BERNAUD TEN.

**Ten Brink, Jan**, *see* BRINK, JAN TEN.

**Tenby**, municipal bor. and seaside resort of Pembrokeshire, Wales, 9 m. E. of Pembroke. It is situated on a narrow promontory jutting out into Carmarthen Bay. T. has a long hist., and by the late fifteenth century was a prosperous little port. Part of the castle and most of the tn walls still exist. By virtue of its unique position and favourable climate T. is a popular holiday resort. Pop. 4500.

**Tench** (*Tinca vulgaris*), freshwater fish with exceedingly small scales, abundant secretion of mucus, and the presence of a short barbule at each angle of the mouth. It is rich olive green in colour, shading into light grey on the belly. It spawns in early summer, the greenish ova numbering about 250,000. Like the carp, to whose family it belongs, it feeds on both animal and vegetable substances. It attains a length of about 18 in. ar. a weight of 4 lb.

**Ten Commandments**, *see* DECALOGUE.

**Ten, Council of**, secret committee of the Venetian Senate, estab. in 1310 and vested with such a measure of executive authority as was deemed effective to cope with extraordinary crises. Its institution marked the final overthrow of the democratic constitution, in favour of a system of close oligarchies of hereditary aristocrats. After the defeat of Tiepolo's revolution (1310) against the growing exclusion of so many Venetians from any share in the government, the aristocratic element deemed it advisable that the Great Council, then composed almost entirely of the nobility, should elect ten of its members, the Doge, his council, and the Supreme Court another ten, and that from these the Great Council should make a final selection of ten to act as a committee of public safety. Eventually the C. of T., though theoretically outside the constitution, became the most powerful organ of government. It was not finally abolished until 1797, the date of the fall of the republic.

**Tender**, in law, offer of money in payment of a debt. To be valid it must be: (1) Unconditional; but a T. will not be invalid merely because it is made under protest. (2) Of the whole debt; though if the creditor's claim is made up of separate items the debtor may validly make a T. of payment of any one item provided he makes it clear in respect of which item it is made. (3) In the current coin of the realm. Bank of England notes of £1 and 10s. are legal T. in Great Britain and N. Ireland to any amount; those of £5 in England and Wales only. Change cannot be demanded except from the Bank of England. Gold (dated 1838 onwards), if of or over the least current weight, is legal T. to any amount. Silver (dated 1816 onwards) is legal T. up to 40s., nickel brass 3d. up to 2s., and bronze (introduced 1860 to replace copper) up to 12d. A valid T. does not extinguish the debt but it exposes the creditor in his action against the debtor as the litigious oppressor, and a plea of T., if sustained by the debtor, will assuredly result in the plaintiff having to pay the costs of the action. But the defendant, if he pleads T., must pay the amount into court. The other effects of T. are that it stops the further accrual of interest, and extinguishes any right of lien (*q.v.*) the creditor may have. T. in commerce is a written offer of terms for executing a specific piece of work or for supplying a certain consignment of merchandise.

**Tendon**, *see under* MUSCLE.

**Tendon of Achilles**, tendon attaching the muscles of the calf of the leg to the heel-bone. It is capable of resisting a great tensional strain, and yet is sometimes ruptured by the contraction of the muscles in sudden extension of the foot. Anc. surgeons regarded wounds in this tendon as fatal, probably because of the legend of Achilles. It was so called from the hero Achilles, whose mother dipped him when an infant into the Styx, so that he became invulnerable except in the heel by which she held him.

**Teneriffe**, or **Tenerife**, largest of the Sp. Canary Is. The volcanic peak of T., Pico de Teide, has an elevation of 12,180 ft. The climate of T. is mild and healthy, and bananas, tomatoes, grapes, sugar, and dates are produced. Tourism is a growing industry. Cap. Santa Cruz de Tenerife, also cap. of the Sp. maritime prov. of T., of which T. is an important port. Area 730 sq. m. Pop. 261,800. (Area of prov. of T. 1329 sq. m. Pop. 427,900.)

**Tengri Khan**, *see* KHAN-TENGRI.

**Tengri-Nor**, lake of Tibet. It is 80 m. from Lhasa and has an area of 950 sq. m. Altitude 15,400 ft.

**Teng-Yuah-ting**, *see* MOMEIN.

**Teniers, David, the Elder** (1582-1649), Flemish painter, b. at Antwerp. He studied painting under Rubens and Adam Elsheimer at Rome. His subjects were familiar scenes of ordinary Flemish life or mythological in subject. Three paintings, including 'Playing at Bowls,' are in the National Gallery, London.

**Teniers, David, the Younger** (1610-90).

Flemish painter, b. at Antwerp, the son of David T., the Elder, from whom he received his prin. instruction. He was a master in the Antwerp Guild (1632-33). He was appointed court painter to Archduke Leopold and keeper of his pictures. His work was mainly a development of his father's style, and was extremely popular. He was happiest in his portrayals of small figures in landscape. His best picture, 'Meeting of the Civic Guards,' is at Leningrad, while his 'Village Fête,' and other works are in the National Gallery, London.

**Tennant, Emma Alice Margaret,** see OXFORD AND ASQUITH, COUNTESS OF.

**Tennant, Smithson** (1761-1815), see under DIAMOND.

**Tenne,** see FALÉMÉ.

**Tennessee,** central S. state of the U.S.A., having an area of 42,246 sq. m. It is known as the Volunteer State. Its boundaries on the N. are Kentucky and Virginia; on the E. N. Carolina; on the S. Georgia, Alabama, and Mississippi; and the Mississippi R. on the W. separates it from Arkansas and Missouri. Along the E. boundaries rise the Unaka and Great Smoky Mts., with peaks over 6000 ft. high, whilst between these highlands and the Cumberland Plateau, the mean elevation of which is 2000 ft., is the valley of K. T. (watered by the upper reaches of the 652-m.-long T. R., scene of the T. Valley Authority (q.v.) project, and its tribs.), part of the Great valley of the Alleghanies. The Cumberland R., affluent of the Ohio, waters a fertile valley W. of the Cumberland Mts. in the N. of the state. There are wide level tracts in the W. between the Mississippi and the lower T. The state enjoys a pleasant climate, the average ann. fall of snow being 8 in. and of rain 52 in. The mean extremes of temp. are 38° F. in the winter and 78° in the summer. Over a half is still woodland, and lumbering and timbering bring in a large revenue; national forest lands cover some 564,471 ac. Cultivated lands are dispersed over the rest, there being 17,788,997 ac. of farmland in 1945. The best crop is maize (63,500,000 bushels in 1947), though conditions favour the growth of wheat, oats, potatoes, and peanuts. Cotton, hay, sweet potatoes, pease, sorghum, tobacco, and fruits, especially strawberries, are also cultivated. Agriculture is the largest single industry, and owes its new prosperity, to a large extent, to the T. Valley Authority. Stock raising has declined since the beginning of the century, but is still important. The fields of bituminous coal cover an area of over 4400 sq. m. Other mineral products are iron, copper, lead, zinc, manganese ore, clay, gold, silver, marble, and cement. There are flour and grist mills, saw-mills and foundries, blast furnaces, textile factories, and tobacco, cotton seed, oil and cake, and leather are prepared. Nashville is the cap. (pop. 167,400), but the largest city is Memphis (293,000), whilst Chattanooga (128,000) and Knoxville (111,600) are also important. Norris Dam is 27 m. N. of Knoxville. During the Second World War production of the

atomic bomb was carried out at Oak Ridge, a 'new' tn. 9 m. from Norris Dam, built specially for the purpose of housing the workers. It was opened to the public in March 1949. T. has good rail and air services, and in the Mississippi and the T. R. has excellent natural waterways. Education is compulsory and there are forty-nine univs., colleges, and professional schools, including eight for Negroes. The state univ. is at Knoxville. Negroes numbered slightly less than one-fifth of the total pop. in 1940. The leading religious denominations are S. Baptists, S. Methodists, and Negro Baptists. T. was explored by De Soto in 1541, and first settled in 1757, as part of N. Carolina. It had its first settlement at Watauga, led by James Robertson in 1769; admitted to the Union, 1796; seceded, 1861; readmitted, 1866. Its General Assembly consists of a Senate and a House of Representatives; it is represented in Congress by two senators and ten representatives. Pop. (estimated 1948) 3,149,000. See T. Oldland, *Tennessee*, 1946.

**Tennessee Valley Authority (T.V.A.),** created by the Tennessee Valley Act in 1933. The authority initiated regional planning on a scale never previously attempted. Among the reasons why the Tennessee Valley was selected as the site of this great experiment was the existence of a large gov.-built nitrate plant, the Mussel Shoals nitrate works at the Wilson Dam, built during the First World War. Proper control of the Tennessee R. was also crucial for the prevention of disastrous floods on the lower Mississippi. There was further the consideration that flood control could be readily related to improved navigation and to the profitable generation of electric power; and the needs of this backward region could largely be met by cheap electric power, which was supplying 750,000 customers in 1948. The Tennessee valley used to be known as one of the most depressed areas of the U.S.A., affecting parts of the states of Alabama, Kentucky, Missouri, Virginia, Georgia, and N. Carolina. Its disastrous state was due to reckless exploitation by early settlers: the soil was barren and the woods had been cut down; the rvs. frequently flooded. Under the T.V.A. water control was begun. Great dams were built and lakes created over forty times the area of the Eng. Lake Dist. Co-ordinated research plans were undertaken throughout the entire area, which is approximately 45,000 sq. m. Soil regeneration, afforestation, malaria control, and similar measures were scientifically applied. National parks were laid out, tourist facilities organised, and cultural and educational activities promoted. The whole project affords a valuable lesson in the possibilities of judiciously applied regional planning, though it was opposed by numbers of influential interests. It should be pointed out that the financial structure of the project has been severely criticised by orthodox economists. Over \$800,000,000 had been spent by T.V.A. by the end of the 1949

financial year, and had increased the income of over 3,000,000 people who had previously been below the 'poverty line.' Expenditure by T.V.A. in the financial year 1949 was \$29,274,390, a decrease of about \$3,000,000 compared with 1948.

**Tenniel, Sir John** (1820-1914), Eng. cartoonist and illustrator, *b.* in London. T. studied at the Royal Academy Schools. His first serious picture appeared at the exhibition of the Society of Brit. Artists in 1836. His design for a mural decoration of the new palace of Westminster in 1845 resulted in his being commissioned to paint a fresco in the House of Lords. Meantime his reputation as a humorous artist had grown, and in 1850 Mark Lemon invited him to succeed Richard Doyle as joint cartoonist with John Leech in *Punch*, his illustrations to *Æsop's Fables* having attracted much attention. His first cartoon was 'Lord Jack the Giant-Killer,' representing Lord John Russell attacking Cardinal Wiseman. Some 2300 cartoons and many smaller drawings were executed by T. before he severed his connection with *Punch* in Jan. 1901. In them can be traced a political hist. of the period (see illustration in article GREAT BRITAIN). His drawing and the originality of his conceptions coupled with his sense of humour make him unrivalled as a cartoonist. His illustrations for Lewis Carroll's *Alice in Wonderland* and *Through the Looking-Glass* have delighted children of all ages, and are his greatest claim to fame. He was knighted in 1893.

**Tennis**, one of the oldest ball games in existence, is often called real T., royal T., or court T. to distinguish it from lawn T., a game which was evolved from T. about 1870. Even in 1100 the game is known to have resembled very closely the T. of to-day.

The royal T. court at Hampton Court is the oldest place in the world where a ball game is still played. It was built in 1529 by Henry VIII., and has served as a model for all later courts erected in England. Henry VII. and Charles II. were good players. Edward VII. played at Princes' when Prince of Wales. Among other courts in active use to-day are those at Lord's and Queens' in London, and at Manchester, Leamington, Oxford, Cambridge, Moreton, Murrel, and elsewhere. The game has been ousted in general popularity by lawn T. and squash owing to the expense of building and maintaining a court.

Regulation courts measure 96 ft. by 31 ft. 8 in. Round the two ends and along one of the side walls runs the penthouse, a sloping roof over the dedans, galleries, and grille. (It is 7 ft. wide and is 7 ft. 1½ in. high at the side of the court and 10 ft. 7 in. at the further edge.) Across the middle of the court is stretched a net, 5 ft. high at the sides and 3 ft. in the centre. In the back wall on the service side is a large rectangular opening—the dedans. On the back wall of the hazard side is a small square opening—the grille. A ball struck so that it enters the dedans, the grille, or the gallery on the

hazard side furthest from the net, known as the winning gallery, wins the point outright. On the main wall, near the grille, is a projection known as the tam-bour. The winner of the toss has choice of ends and usually takes the service side. A service to be good must strike the penthouse at least once on the hazard side of the court and drop into a prescribed area on the floor. The striker-out may volley the service or return it at first bounce. Basically the scoring is as in lawn T. except for a great number of variations; e.g. if the server fails to touch the ball with his racquet when it is returned, the marker watches where the ball falls on its second bounce, and calls the chase, the floor being marked with chase lines for this purpose. That point is held in abeyance, and when two chases have been made the players cross over, and the one who is now striker-out must make a better, i.e. shorter, chase in order to win the point. If he makes the same chase, the score remains unaltered, and the marker calls 'chase off.' If other player is at game point, they cross over if one chase is made.

A short chase is made by playing the T. 'stroke,' i.e. a heavily cut stroke that comes down sharply off the wall below the dedans. There are also chases on the hazard side. A set is the best of eleven games. The balls are solid and should not be less than 2½ in. and not more than 2¾ in. in diameter. They should weigh not less than 2½ oz. and not more than 2¾ oz. There are no restrictions as to size or shape of racquets. The game is played by two or four players.

The first recognised world champion was Clergo (France, 1750). The present world champion (since 1928) is Pierre Etchebaster (France). Recent amateur champions are E. Baerlein (1914-27, 1929-30), L. Lees (1928, 1931, 1933-37, 1946), Lord Aberdare (1932, 1938), W. D. Macpherson (1939), Lord Cullen (1947), P. Kershaw (1948), Ogden Phipps (1949), Alastair Martin (1950). See C. G. Heathcote, *Tennis, Lawn Tennis, Rackets, Fives, 1903, and Rackets, Squash Rackets, Tennis, Fives and Badminton* (Lonsdale Library vol. xvi.).

**Tennis, Lawn**, see LAWN TENNIS.

**Tennyson, Alfred, first Baron** (1809-92). Eng. poet, *b.* at Somersby, Lincolnshire, son of the rector of Somersby, and younger brother of Charles Tennyson-Turner and Frederick T., both of whom were poets. He was educated at Louth Grammar School and at Trinity College, Cambridge. It is only in recent years that research has shown how unhappy T.'s childhood and youth must have been. His father was eccentric and morose, and later became mentally unbalanced, and the whole family displayed extreme neurotic tendencies. Biographers suggest that this background accounted for much of T.'s remarkable sensitivity and reserve in later years. In 1827 he pub., with his brother Charles, a vol. called *Poems by Two Brothers*, to which Frederick had also contributed. At Cambridge T. won the chancellor's medal for Eng. verse in 1829,

and next year brought out a vol. of *Poems, chiefly Lyrical*. This contained some verse of great promise, and was favourably reviewed by Leigh Hunt, though Blackwood made some scathing criticisms. T. was deeply hurt by these, and sought an escape in a tour of France, Germany, and Italy with Arthur Henry Hallam (q.v.). From the pictorial impressions he gained on this tour he took the inspiration of many of his later poems. In 1833 he pub. a vol. which included

extremely happy marriage. In April 1850 Wordsworth died, and the poet-laureateship was offered to Samuel Rogers (q.v.), who declined it on account of his advanced age. T. was then offered the honour, and immediately accepted.

The *Ode on the Death of the Duke of Wellington* appeared in 1852, and three years later the popular *The Charge of the Light Brigade* and *Maud*. Of all poets laureate, T. was perhaps the best able to produce patriotic stanzas which possessed inspiration and real poetic quality; but work of this type was not his true *métier*, and it is by his lyrics that T. should be judged, though *Maud* has scenes of great power and contains some of T.'s finest poetry. In 1859 *Idylls of the King*, variations in lyric form on the Arthurian romances, were pub. These contain some of T.'s loveliest descriptive passages, and have a music and a pathos which links them with the much earlier *Lady of Shalott*. T.'s Arthurian legends have not the vigour and fire of Malory's interpretation; but they possess a stately, rich grandeur equally effective in describing an ornately vivid tournament scene, the pathos of Elaine, and the final tragedy of the defeated Arthur. His other works include *Locksley Hall* (1886) and a number of poetic dramas which, though they enjoyed contemporary popularity, are inferior to his other poetry, and generally lacking in the essential dramatic qualities.

His own age saw T. as midway between Virgil and Shakespeare; but a more just appreciation would attempt no comparisons, and would rather point to his richly decorative phrases, his happy expression of aspirations in which his age devotedly believed, and to the flashes of rippling lyricism which mark the height of his real genius. There are biographies and studies by his son Hallam (1897), H. Nicolson (1923), H. P. Anson Fausset (1929), and Sir C. Tennyson. See also W. H. Auden, *Tennyson: an Introduction and a Selection*, 1946.

**Tenor**, see under JOINTERY.

**Tenor**: 1. Highest adult male voice, the compass being from tenor C to treble A, i.e. an octave below soprano. It is so called because in the old plainsong the T. part was of sustained notes around which the harmonics were set. 2. Instrument, especially the viola, playing part between bass and alto. 3. Tenor bell, the largest of a peal or set.

**Tenrec**, or Tailless Hedgehog, see CENTETES.

**Tension**. Newton's third law states that action and reaction are always equal and opposite. Where the action and reaction of two bodies tend to keep them apart, these constitute a thrust, but where they tend to keep two bodies together they constitute a T. A good illustration is a tug of war, the T. in the rope being the same everywhere. T. is measured in the same way as other forces—in pounds, or dynes in the c.g.s. (centimetre-gramme-second) system.

**Tent**, movable dwelling or shelter made of cloth, skins, or tree bark supported by



N.F.G.

ALFRED, LORD TENNYSON

Painting by G. F. Watts.

*The Lady of Shalott*, the *Lotus Eaters*, and *A Dream of Fair Women*. These were unfavourably reviewed by the *Quarterly*, but were liked by the general public, and T.'s work began to be known and admired by a small circle. He pub. no more poetry for nine years; this delay was partly due to his sensitive dislike of the bitter criticism which had been directed at his earlier work, but also because in these early years T. wrote far more slowly, and often with more discernment, than he did when he became famous. *The Princess* (1847), a fancy, written mainly in epic style, but embodying some of his finest lyrical fragments, was T.'s first great popular success, and this ran through five eds. in six years. But he achieved immediate and nation-wide fame with *In Memoriam*, which he had begun in 1833, as an elegy to Hallam. The theme expanded under the poet's hands and so the work, while not ceasing to be personal, became a great religious poem as well. It expresses the spiritual conflict which followed upon his friend's death, and sets forth his faith in God, immortality, and the 'one far-off divine event to which the whole creation moves.' *In Memoriam* was pub. anonymously in 1850. It was praised lavishly on all sides, and T.'s improved financial position enabled him to marry Emily Sellwood, to whom he had been engaged for sev. years. This was an

poles and secured by ropes and pegs. Ts. have been used by nomadic peoples since the dawn of hist. Those used by the Bedouin Arabs are made of strips of woven goat's hair and have changed little in construction since O.T. days. The *tepi* of the N. Amer. Indian is a conical-shaped T. made generally of skins or tree bark stretched over a tripod of poles. Also in the N. Amer. continent is found the flimsy summer skin T. of the Eskimo. Probably the most luxurious T. used by nomadic tribes is the Mongol *yurt*, a felt-covered dwelling with walls of latticed hurdles; richly embroidered felt curtains line the interior and form partitions. Ts. have long been recognised as a means of housing troops in active service areas. In the W. world Ts. are now generally used by people visiting open spaces, enabling them to remain independent of permanent dwellings. Modern Ts. vary in size from the smallest one-man sleeping shelter to the marquee of many hundred feet in length, but have in common the fact that they are generally made of canvas suspended on a minimum framework of poles—sometimes only a single pole—and are held secure by adjustable guy-lines of cord or rope attached to pegs in the ground.

**Tenterden**, Charles Abbott, first Baron of Henden (1762-1832). *b.* at Canterbury. His father was a barber, and sent him to King's School at Canterbury. From there he gained a scholarship to Corpus Christi College, Oxford. He studied the law and was admitted to the Bar, and became a special pleader. He was made recorder of Oxford in 1801, and the following year pub. his treatise *Law relative to Merchant Ships and Seamen*. His treatise is still an authority in mercantile law.

**Tenterden**, municipal bor. (since 1449) of Kent, England, 18 m. S.S.E. of Maidstone. At one time it was a member of the Cinque Ports Confederation as a limb of Rye. Its thirteenth-century church (St. Mildred's) once formed part of an Augustinian monastery, and is crowned by a lofty Perpendicular tower. T. is an agric. centre. Pop. 8500.

**Ten Thousand**, Expedition of the. In anct. Gk. hist. the 'Ten Thousand' was an army originally composed partly of large levies of native troops in the Persian satrapies of Asia Minor, but mainly of Gk. mercenaries, collected by Cyrus, younger son of King Darius II. of Persia, hoping to win the crown from his elder brother Artaxerxes II. At the battle of Cunaxa (401 B.C.) the Gks. routed their opponents but Cyrus was killed. The native levies at once dispersed and the Gk. mercenaries found themselves marooned in Mesopotamia. Their officers were killed by a trick of the enemy. The Gks. chose new officers, among them Xenophon (*q.v.*), the historian of the expedition, and fought their way N. into the Armenian mts. Ultimately they reached the Euxine at Trapezus (Trebizond). A graphic account of the remarkable wanderings of the Ten Thousand is contained in the *Anabasis* of Xenophon.

**Tenths**: 1. The tenth part of the ann.

profit of an eccles. living which formerly was transferred to the Crown. Afterwards various benefices were exempted from payment of T. altogether (*see under* QUEEN ANNE'S BOUNTY; TITHES). 2. In music, the octave of the third; an interval comprehending nine conjoint degrees, or ten sounds, diatonically divided.

**Tentyra**, or Tentyris, *see* DENDERA.

**Tenure**, Feudal. Tenure is defined by Williams as the relation between feudal lord and tenant of land (*Real Property*). This is sufficiently accurate because the feudal system is the foundation of modern Eng. real property law, although the fabric of that system was effectually shattered in the early part of the seventeenth century. The theory that all land was held mediately or immediately of the sovereign in return for either free or base services was essentially a Norman innovation into England adapted by the Conqueror from continental feudal institutions. In return for his loan of land the feudal tenant was bound to perform either *free* or *base* services. From these services were developed respectively freehold tenure and copyhold through tenure in villeinage. Of freehold tenures the most honourable was that of knight service. Most of the anct. feudal incidents were abolished by the Statute of Tenures, 1660 (12 Car. II. c. 24), which assimilated knight service to 'free and common socage.' Generally speaking, all the anct. forms of tenure were abolished by the Law of Property Act, 1925. *See also under* DE DONIS, ENTAIL, ESCHEAT, ESTATE, FORFEITURE, LAND, LAND LAWS, and LANDLORD AND TENANT; and also under the various forms of tenure.

**Teocalli**, *see under* MEXICO, *Archaeological Research*.

**Tephigram** ( $T\phi$ -gram) is used in meteorology to complete (in a vertical direction) the weather analysis achieved horizontally in a weather map. It was introduced by Sir Napier Shaw, its name being derived from the main co-ordinates, temp. (T) and entropy ( $\phi$ ). If air expands (as it must in ascent, for pressure decreases with height) without absorbing heat from any source its temp. falls because of the work done in expansion. This is an 'adiabatic' expansion, and the consequent rate of loss of temp. with height or 'lapse rate' is constant at  $5.4^\circ \text{ F./1000 ft.}$  When the air has cooled to its dew point it becomes saturated, and any further lifting above this level, called the condensation level, causes condensation into cloud droplets which are carried up with the rising air, and eventually rain or snow may be formed (*see further under* RAIN). The liberated latent heat of condensation warms the air somewhat, and the new 'saturated adiabatic' lapse rate is therefore less than the 'dry adiabatic' above, the difference being greatest at high temps., where most water vapour is available for condensation. The T. has five sets of lines on it: (1) slightly curved diagonal lines representing equal pressure; (2) vertical lines representing equal temp.; (3) dry adiabatics or lines of equal entropy,

represented by horizontal lines; (4) saturated adiabatics, represented by curved lines which become almost parallel to the dry adiabatics at low temps. where there is little moisture in the air; and (5) steeply sloping lines representing humidity mixing ratio of saturated air (*see further under* HYGROMETER). A point on the T. can be defined by temp. and pressure, and it can therefore represent the state of a small parcel of air; and a line (the 'environment curve') can equally represent the state of the air at all levels. Vertical motion (*i.e.* between two pressure levels) is represented by a movement of the point along the appropriate adiabatic (saturated or dry); the dew point (which may be defined as the temp. to which the air must be cooled to achieve saturation) moves along a saturated mixing-ratio line, and where it meets the corresponding dry adiabatic is the condensation level. It is therefore easy to detect and measure on a T. the movement of air over colder and warmer surfaces, up and down hills and over or under other masses of air, and the ascent or descent caused by regional inflow or outflowing.

**Atmospheric Stability.**—If the environment curve shows a greater lapse rate than the corresponding adiabatic (dry or saturated according to whether the air is dry or saturated) air slightly disturbed will be warmer (and lighter) than its surroundings in ascent and cooler (and heavier) in descent. Convection will therefore arise automatically and the air is unstable. The greater the instability the more violent the convection, the most violent being in thunderstorms, tornadoes, and waterspouts (*q.v.*). If the lapse rate is less than the corresponding adiabatic the air is stable and no convection occurs. Limited depths of instability (*e.g.* near the earth on a sunny day) may be extended to great heights by convection reaching above the condensation level, with consequent decrease in adiabatic lapse rate for ascending air; instability may also develop by bodily lifting until much of the air becomes saturated. All these effects can be traced easily on a T.

**Air Mass Analysis.**—Coming from different geographical regions, air masses (*see* METEOROLOGY) have distinctive environment curves on the T. The distinction is especially clear if 'Normand' curves formed by joining condensation-level points corresponding to each point of the environment curve are used. The Normand curves have the property of not changing their position relative to the curved saturated adiabatics throughout any lifting or descent, or even if any rain falls from or is evaporated into the air. One air mass lying over the top of another as in a front generally appears as a distinct discontinuity in the Normand curve, even if it appears to be quite smooth in the environment curve. The shape of the Normand curve can only be altered by radiation, which changes the pattern in lower levels or, very slowly, near cloud tops, by mixing, which tends to uniformity, or by horizontal inflow and outflow, which extends or squashes the

pattern in height. Ts. can thus help to identify air masses even if their previous hist. is unknown.

**See** Admiralty; Hydrographic Dept., *Admiralty Weather Manual* (H.M.S.O.), 1938, 1941; D. Brunt, *Physical and Dynamic Meteorology*, 1939, 1941; S. Petterssen, *Convection in Theory and Practice* (Geofysiske Publikasjoner, Oslo vol. xvi., No. 10), 1946.

**Teral**, *see* TAKAL.

**Teramo** (anc. Interamnium), tn. in Italy, cap. of prov. of same name on the R. Tordino. It is the seat of a bishopric, and has a fine cathedral with a spectacular fourteenth-century Gothic portal, and sev. churches. There are many Rom. remains. Chief manufs. are wool, silk, and pottery. Pop. (prov.) 274,900, (tn.) 38,700.

**Teraphim**, biblical term of uncertain etymology, indicating probably small portable images (Gen. xxxi. 19, 35), such as have been dug up often in the course of excavation. They were household deities, and may have constituted a sort of legal title of ownership for the house. They have often been compared to the Rom. *lares* and *penates*, which were supposed to protect the home and bring it good luck. The T. were closely associated with the practice of divination (1 Sam. xv. 23; Zech. x. 2); would drive away evil spirits and plague demons (1 Sam. xix. 13 ff.).

**Teratology**, science dealing with abnormal developments of formations of parts of the body, and with monstrosities. **See** ALBINISM; BOTANY; CLUBFOOT; DEFORMITY; DWARF; GALLS; GIANTS; HERMAPHRODITE; HERNIA; HYBRID; PATHOLOGY; etc.

**Terbium**, metallic chemical element, symbol Tb, atomic number 65, atomic weight 159.2. It is a member of the group of rare earths.

**Ter Borch, Terborch, or Terburg, Gerard** (1617–81), Dutch painter, b. in Zwolle. He studied under his father, Geert Ter Borch, and later in Haarlem under Mollijn, and in Italy and France, and visited England, Germany, and Spain. One of his masterpieces, 'Peace Congress of Munster,' is in the National Gallery, London. His technique was fine and, painting mainly interiors, he chose his figures, usually not more than three, from the wealthier classes. He delighted in rich costumes, and bathed his pictures in a clear, silvery tone. *See* lives by F. Hellens, 1911, and W. Rothes, 1921.

**Terecira**, *see under* AZORES.

**Terebene**, colourless liquid consisting of terpene and other hydrocarbons. It is prepared by treating turpentine with successive quantities of sulphuric acid and distilling the product. The smell of T. resembles thyme or pinewood, and it is used as an antiseptic and deodoriser.

**Terabinth, or Turpentine Tree** (*Pistacia terebinthus*), small tree belonging to the family Anacardiaceae, from which Cyprus turpentine is obtained by making incisions in the trunk. *P. lentiscus* yields mastic (*q.v.*), and the fruits of *P. vera* are called pistachio nuts (*see* PISTACHIA).

**Teredo**, Ship Worm, Woodworm, or

**Pileworm**, genus of lamellibranch molluscs with a long worm-like body clothed in a thin shelly tub or sheath. The true bivalve shell is small and occurs at the thicker end where it protects the various organs. At the more slender end are two tubes, one of which conveys water to the gills and the other expels it with excavated matter. With its sucker-like foot it bores into timber, and is very destructive to ships, piers, and submarine cables. From 1914 to 1920 it caused damage in San Francisco Bay estimated at \$10,000,000. Francis Drake's *Golden Hind* was destroyed by the T.

**Terence (Publius Terentius Afer)** (195-159 B.C.), Rom. comic poet, b. at Carthage. He was the slave of a Rom. senator, P. Terentius Lucanus, who brought him to Rome. He received a good education from his master and was manumitted. His first play was the *Andria*, said to have been much praised by Cæcilius, the foremost comic poet of the time, and by the pub. of this he found himself introduced into the most intellectual circles of Rome. He became acquainted with the younger Scipio, Lælius, and Furius Philus, and through Scipio probably had an introduction to Polybius. He spent some time in Rome, but eventually went to Greece, where he occupied himself with translating the works of Menander, whom he took as his model. Of his works only six are extant: *Andria*, first represented in 166; *Heccyra* (165); *Heauton Timoroumenos* (163); *Eunuchus* (162); *Phormio* (162); and *Adelphi*, which was first acted at the funeral games of L. Æmilius Paulus, 160. These are probably all that T. produced. They are founded on Gk. originals, but T. retouched and improved his models. Though a foreigner and a freedman, T. wrote some of the finest Lat. that exists. There are eds. by A. Wagner (1869, 1892); A. Fleckeisen (1857, 1898); R. Y. Tyrrell (1903); and R. Kauer and W. M. Lindsay (1926).

**Teresa, or Theresa, St.** (1515-82) Sp. saint, nun, and monastic reformer, b. Teresa Cepeda de Almadra at Avila. She entered a Carmelite convent in her native tn. in 1533, but seeing the relaxation of discipline within the religious orders determined on reform, and set about founding a house in which all the original rules of the Carmelite order would be observed. She met with great opposition from clerical and lay authorities, but having obtained permission from the pope, she estab. (1562) the auct. Carmelite rule at a small house in Avila which she dedicated to St. Joseph. Here the sisters (at first only four in number) lived subject to the strictest discipline. After a time the number was increased to thirteen, and T. herself took up her abode with them. Between 1562 and her death she founded fifteen new houses directly, and seventeen indirectly, through the intervention of others. With the help of St. John of the Cross she estab. her reform among the Carmelite friars. St. T. was canonised in 1622. Her feast-day is on Oct. 15. Her works include *The Way of Perfection*, *The Castle of the Soul*, and *The Book of the*

*Foundations*, all of which have been trans. into Eng. by E. A. Peers (1946). See lives by G. Cunningham-Graham, 1894; H. Waack, 1947. See also Victoria Sackville-West, *The Eagle and the Dove*, 1943.

**Ter-Gouw**, see GOUDA.

**Tergoviste**, see TARGOVISTE.

**Terminable Annuities**, see under PUBLIC DEBT.

**Terminal Velocity**. If a body moves under the influence of a continuous force in a resisting medium, the resistance being some function of the velocity of the body, there is a limit to the velocity that it can attain. This limit is known as the T. V. and is the velocity to which that of a body falling through the atmosphere continually tends. The T. V. is small for snowflakes, greater for drops of rain, and greater still for hailstones, and it depends partly on the size and density of the falling body.

**Terminator**. The line which divides the dark from the illuminated portion of the disk of the moon or of a planet.

**Termites (Termitidae)**, family of insects (family Isoptera), characterised by the possession of biting jaws and by the absence of a metamorphosis. T. are the only insects other than those belonging to the Hymenoptera which are known to exist in organised communities. In their habits they resemble ants in many respects, and are often called 'white ants,' though structurally they differ from ants very considerably, while their communities are differently composed. The communities consist of 'kings' and 'queens,' which are fertile males and females that have cast their wings by a rupture at a transverse suture close to the root, and of infertile males and females whose wings never develop, and who become 'soldiers' or 'workers' according to the nature of their food. The head is large, and though many forms are blind others have compound and simple eyes. The 'soldiers' are provided with especially large heads and powerful mandibles. The queen's abdomen becomes enormously swollen, her ovaries producing eggs at the rate of about one per sec. She and the king are usually confined in the central cell in the nest, and in case of disaster to them, nymphs are always in readiness to take their places, after stimulation of their reproductive organs by special feeding. T. are confined to the tropical and warmer temperate regions, some species occurring in S. Europe. They feed on wood and waste substances, and construct earthen tunnels and galleries, cementing the walls of their runs with their excrement, which hardens like brick. Some of the tropical species raise vast earthen nests as much as 20 ft. high. They are very destructive, especially of woodwork and of wood foundations of buildings. Wood treated with creosote is immune, and wood that has been attacked may be cleared by fumigation.

**Termonde**, see DENDERMONDE.

**Terms**: 1. In law the limitation of an estate or the whole time or duration of an estate, as a lease for the T. of twenty-one years, for the T. of three lives, etc. (see also LIMITATION OF ESTATES; SHELLEY'S

CASE, RULE IN; VENDORS AND PURCHASERS). 2. The law T. or portions of the year during which the high court sits. They are four in number, viz. Hilary, which usually begins about Jan. 11 and ends about the end of March; Easter, which begins in the early part of April and ends in the middle of May; Trinity, which begins towards the end of May and ends towards the end of July; and Michaelmas, which begins in the second week in Oct. and ends just before Christmas. The 'Inns of Court' T., called by the same names as the above, are the 'dining terms' for students, who in the process of qualifying for call to the Bar fulfil the notion of residence that obtains in colleges or other places conferring degrees, by eating dinners during term time. 3. In univs. and colleges the time during which instruction is regularly given to students. Schools have adopted the same system. 4. In formal logic, the expression in language of the notion obtained in an act of apprehension. T. are divided into simple, singular, universal, common, univocal, equivocal, abstract, concrete, etc. (see also SYLLOGISM). 5. In algebra, a member of a compound quantity, as  $a$ , in  $a + b$ ; or  $ab$ , in  $ab + cd$ .

**Tern**, or **Sea Swallow** (*Sterna*), genus of birds resembling the gulls, to which they are allied, but smaller and slenderly built and with a forked tail. They are extensively distributed, especially in temperate climates. Though poor walkers and swimmers, they are very active on the wing, skimming the surface of the sea from sunrise to sunset in search of small fish and other marine animals. A number of species occur in Britain, the commonest of which is *S. fuscicollis*, with grey plumage. The others are the sooty T. (*S. fuscigaster*), the Arctic T. (*S. macrura*), the Sandwich T. (*S. castria*). The Arctic T. is remarkable for the range of its migration, from Greenland, N. America, and N. Europe as far S. as the Antarctic. The black T. and other similar species known as marsh Ts. are now placed in the genus *Hydrochelidon*. They are distinguished by their shorter bills, short and slightly forked tails, and less fully webbed feet.

**Ternate**, tn. and is. in the Malay Archipelago, one of the Molucca Is. The tn. was formerly the headquarters of the Dutch residency of the is. It now forms part of E. Indonesia. It has a gov. quay and private pier, but there is no considerable trade or shipping, its harbour being unsuited to large ships. Some quantity of rice, sago, and pepper is produced and exported. Area 115,900. Pop. (18.) 494,000, (tn.) 87,300. See further under MOLUCCAS.

**Terneuzen**, seaport of Zeeland, Netherlands, situated on an arm of the Scheldt, 28 m. W.N.W. of Antwerp. It is at the end of the 20½ m.-long Ghent-T. canal. Pop. 12,900.

**Terni**, tn. in Perugia, Italy, cap. of the prov. of T., among the Apennines, with steel works and iron foundries. There are also manufs. of jute, electrical machinery, and textiles. There are sev. Rom. ro-

mains, and it is the bp. of the Emperor Claudius. In the Second World War the cathedral was heavily damaged and sev. medieval and baroque buildings also suffered. Pop. (tn.) 79,400, (prov.) 216,900.

**Terpenes**, name given to hydrocarbons which occur in essential oils and have a molecular formula  $C_{10}H_{16}$ . They are all volatile, and are unsaturated compounds. The most important members are limonene, camphene, and pinene (*q.v.*). Many Ts. are derivatives of cymene (para-methylisopropylbenzene), and sev. of them have now been synthesised.

**Tarpsichore** (Gk. 'delighting in the dance'), muse of choral song and dance. See further under MUSES.

**Terra**, or **Tellus**, see GÆA.

**Terra Australis Incognita**, vast unknown continent which was commonly believed to lie beyond the ocean of the S. hemisphere as a counterpart to the land masses of Europe, Asia, and Africa. The belief was held by the geographers of antiquity and the Middle Ages and was only finally exploded by Capt. James Cook in the late eighteenth century. T. A. I. was believed to stretch in a solid mass as far N. as Tierra del Fuego as late as the sixteenth century. Discoveries by Magellan, Drake, Torres, Tasman, and other explorers gradually brought about a realisation that this supposed land mass did not exist; finally, Cook ascertained the limits of Australia and of the Antarctic continent and proved the original theory entirely false.

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**Terraces**, in geology, are horizontal shelves or benches on hillsides or on sloping ground. River T. occur wherever the valley has been sufficiently widened and graded to allow formation of flood-plain. On reduction of the level of the flood-plain, the portions resting on the valley slopes are left as ledges, and indicate the various steps in the processes of erosion and oscillations in sea level. Smaller T. are formed in higher courses of rvs. by the washing up of material forming the banks; they are not level, but have a slight gradient towards the riv. See also BRACHES, RAISED.



**Terracina** (Anxur), city and seaport of Italy on the S. coast of the prov. of Latina, 60 m. S.E. of Rome. There is trade in wool and cereals. In the old tn. is the celebrated temple of Venus, thought to be the palace of Theodorice. There are sev. other Rom. remains, and the Gothic cathedral is founded on the ruins of a Rom. temple. The Rom. aqueduct is still used. T. was an important tn. on the Appian Way but is now chiefly a tourist centre. Pop. 26,100. *See also under* ANXUR.

**Terra Cotta** (It., baked earth, Lat. *terra cotta*), hard, unglazed pottery fabric, used for bricks, tiles, and architectural ornaments, as well as for tombs and coffins, vases and statues. It may be left with its natural brownish red surface unglazed and uncoloured, or it may be painted as was customary among the Gks., or it may be covered with enamel.

**Terra del Fuego**, *see* TIERRA DEL FUEGO.

**Terra di Lavoro**, *see* CASERTA.

**Terra Japonica**, *see under* CATECHU.

**Terramare** (from It. *terra*, earth, and *marina*, marl), natural fertiliser found in the valley of the R. Po, Italy, in flat-topped mounds which were vils. of peoples of a Bronze Age culture. The settlements, which were built on pile foundations but which were nevertheless on land, have taken generally the name of the fertiliser. *See* T. E. Peet, *The Stone and Bronze Ages in Italy*, 1909, and C. F. C. Hawkes, *The Prehistoric Foundations of Europe*, 1940.

**Terranova**, or **Gela**, seaport S. of Sicily in the prov. of Caltanissetta. It was founded at the end of the thirteenth century on the site of the anct. Gela (*g.r.*). There are manufs. of coarse cotton and woollen goods, and fisheries of tunny and sardines. Wine, grain, sulphur, and soda are exported. Pop. 41,300.

**Terrapin**, name given to various tortoises of the family Testudinidae, some of which, especially *Malaclemmys terrapin*, found in the salt marshes on the E. shore of N. America, are highly valued as food. Among the most important are the yellow-bellied, the red-bellied, the chicken, and the salt-water Ts. They are all active swimmers, their clawed digits being united by a web. They are almost omnivorous, but feed chiefly on aquatic animals. In America and Australia they are commonly kept and fattened in captivity. *See also under* TORTOISE.

**Terra Sigillata**, *see* SAMIAN POTTERY.

**Terre Adèle**, *see* ADELIE LAND.

**Terre Haute**, city of Indiana, U.S.A., co. seat of Vigo co., on Wabash R., 68 m. W.S.W. of Indianapolis. The centre of an agric. and a coal-mining region, it is now a predominantly industrial city, has foundries, and manufs. iron goods, cars, clothing, glass, etc. There is a state teachers' college and polytechnic engineering institute. Pop. 62,700.

**Terre-Neuve**, *see* NEWFOUNDLAND.

**Terrestrial Magnetism**, *see* MAGNETISM, *Terrestrial Magnetism*.

**Terrier**, term originally applied to dogs which pursue rabbits and other game into their burrows. The Kennel Club lists the

following as true Ts.: Airedale, Australian, Bedlington, Border, Bull, Cairn, Dandie Dimmont, Fox, Irish, Kerry Blue, Lakeland, Manchester, Norwich, Scottish, Sealyham, Skye, Staffordshire Bull, Welsh, and West Highland White. But the word is also now applied to a number of breeds, many of which are too large and some too pampered to justify the name; these include Boston Ts. The true T. is a particularly intelligent dog. *See separate articles.*

**Terrier**, Old, or White, English, *see* OLD or WHITE ENGLISH TERRIER.

**Terriess**, **William** (1847-97), Eng. actor, b. in London, his real name being Wm. Charles James Lewin. He was educated privately. He tried sev. careers, serving for a time in the merchant navy, but went on the provincial stage in 1867, and soon came to London. His best parts were Squire Thornhill in *Olivia* and William in *Black-eyed Susan*. He was assassinated at the stage door of the Adelphi Theatre by a mad and unsuccessful actor.

**Territorial Army**. *History*.—When the Brit. infantry was territorialised under Lord Cardwell's scheme of 1881, volunteer rifle corps were linked with regular and militia units to form the regimental dist. For this reason most T. A. infantry units now bear the title of a line regiment (*e.g.* (Green Howards) with a battalion number above 4. There are exceptions to this, of the following order: 'expatriate' units with titles like Tyneside Scottish; battalions from cos. which do not support a regular regiment, such as Cambridgeshire, Hertfordshire, and Herefordshire; numerous London Light Infantry units with roots in the 1859 Volunteer Movement such as the Artists' Rifles, Queen's Westminster, etc.; and the unique Honourable Artillery Company which was formed before the regular regiments existed; nevertheless every T. A. unit is affiliated to some regular unit whether it shares its name or not. Under the Cardwell scheme this affiliation means little in practice but after the passing of the Territorial and Reserve Forces Act of 1907 and Lord Haldon's administration of it, liaison between regular and T. A. units became a reality. Under this Act co. associations were formed which raised and administered (but did not command) the new territorial force. These associations still function under the 1947 reorganisation.

The territorial force was intended at first for home service only, but provision was made for individuals to volunteer for overseas service. In 1914 so many of the 11,900 officers and 302,000 other ranks did so volunteer that war units were mobilised in their entirety and brigaded in the fifteen territorial (and yeomanry) divs., which took part in the First World War (*see table below*). The fourteen mounted brigades which completed the force up to 1914 were not employed as such but the fifty-three regiments of which they were composed went to reinforce other armies or to form the 74th Div., where units came from all parts of the United Kingdom. The other fourteen divs. were at first

known only by their regiment designation, and the now well-known members were not allotted until May 1915; the regimental titles are shown in the first column of the table at the end of this section.

Up to 1914 the defence forces by land consisted of: first line, regular army; second line, special reserve; third line, territorial force. In 1920 a reorganisation promoted the territorial from third to second line and renamed them the T. A.; the special reserve reverted to its old name of militia (*q.v.*), but in practice no militia was raised until 1938. The 1920 estab. provided for the same fourteen infantry divs. (but only two brigades of cavalry), some army troops, and a coast defence and an anti-aircraft (A.A.) component. Now the obligation to serve overseas was placed on all members. A small proportion of the cavalry was mechanised. About 150,000 men were recruited and numbers remained at about this figure until 1938. In 1935 a new estab. was drawn up and partly put into effect: 46 and 47 Divs. were disbanded and went to fill the ranks of five A.A. divs.; the field force was now to consist of nine infantry, three motorised, and one armoured div. Now for the first time old promises were implemented: some brigades and a few divs. were commanded by T. A. officers, and the deputy director general was also a T. A. officer. In 1938 numbers rose to 204,000 and between them and the outbreak of war almost doubled. But of these 405,000 some 107,000 belonged to air defence units, so that approximately the same numbers were available for the field force as in 1918. During the war the T. A. ceased to exist as a separate force and recruiting for it ceased. But the fusion of regular T. A. and conscript elements in the air defence force, which then retained only men of certain medical categories, had the effect of releasing enough fit men to form a further seven divs., largely composed of territorials, for the field force (these divs. are shown second in the second column of the table).

#### Divisional Numbers

Regiment	1914-18	1939
E. Lancs.	42	42
Wessex	43 & 45	43 & 45
Home Counties	44	44 & 12
N. Midland	46	46 &
London (No. 2 area)	47	47
S. Midland	18	48 & 61
W. Riding	19	49
Northumberland	50	50
Scottish Highlands	51	51 &
Scottish Lowlands	52	52
Wales	53	53 &
E. Anglia	54	54 &
W. Lancs.	55	55
London (No. 1 area)	56	56
All England	74 cavalry	--

As in 1920, so on Jan. 1, 1947, the T. A. was re-estab. The A.A. divs. remain but are now called groups. There are besides the field force some independent brigades

and a much higher proportion than heretofore of corps, army, and G.H.Q. troops, to be drawn principally from regions where the field force div. has been disbanded. Since June 1950 national servicemen on completion of their eighteen months' full-time service with the regular army, now undertake a further four years' part-time service in the T. A.; they are required by law to complete a total of sixty days' training with the T. A. during these four years.

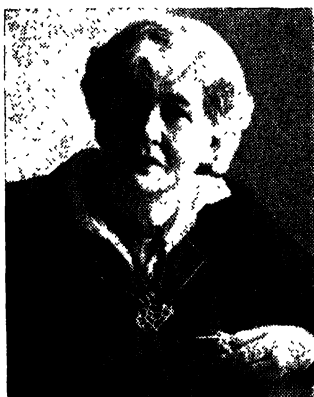
**Pay and Conditions of Service.**—The permanent staff of T. A. units (adjutants, quartermasters, instructors, some unit commanders) is composed of regular officers and N.C.Os. Officers of the T. A. must be Brit. subjects and sons of Brit. subjects of pure European descent. Promotion conditions follow much the same lines as for regular officers. 'Boys' (*i.e.* recruits under eighteen) are no longer listed. When in camp, territorials receive pay and allowance on the same rate as regulars. Travelling expenses from home to place of training are paid. All ranks receive a bounty if present on embarkment, and all except officers receive an ann. bounty (originally £3, now £12) on completing ann. training. The requirements of the latter vary from term to term but amount generally to about ten full days and some fifty drills of two hours each.

**Territorial Waters.** Most modern states recognise the sovereignty of every other state over its own marginal waters. The limit is generally fixed at one marine league from the shore measured from low-water mark. This distance of permissible appropriation is the subject of much criticism by writers on international law, because it was in its origin suggested by the supposed range of a gun; the tremendous range of modern artillery has made the distance meaningless (*see* on this W. E. Hall, *International Law*, 8th ed., 1924). Three m. at low-water mark, however, remains the minimum claim to sovereign control of the high seas. A more extensive jurisdiction to the waters surrounding their coasts is claimed by some states, though this extended claim may be restricted to certain specific purposes. The acquittal for want of jurisdiction of a Ger. prisoner charged at the Central Criminal Court with manslaughter through the running down of the *Strathclyde* by the *Franconia* (in the famous trial of *Reg. v. Keyn*, 1876) 2 m. off Dover led to the passing of the Territorial Waters Jurisdiction Act, 1878. By that Act the Eng. courts have jurisdiction to arrest and try persons, whether Brit. subjects or not, for offences committed on the high seas within the T. W. of the Crown, *i.e.* within one marine league from the coast. (*See* L. Oppenheim, *International Law* (vol. I., *Peace*, 6th ed.), 1947.

**Terror, Reign of**, *see* under FRANCE. *History*.

**Terry Family**, Eng. actors and actresses. Benjamin Terry (1818-92) and his wife were well-known provincial actors, although in their later years they also had engagements in London with Macready

and Charles Kean. Their children were: (1) *Kate Terry* (1844-1924), the eldest of the family, made her first appearance on the stage in 1850, and the next year came to London and was engaged by Charles Kean. She appeared as Cordelia, Ophelia, Ariel, Juliet, Viola, all of which she played with remarkable success, but especially made a great hit in 1862 by her part of Mrs. Union in *Friends or Foes*. (2) *Dame Ellen Alicia Terry* (q.v.) (1848-1928). (3) *Marion Terry* (1856-1930) won a great reputation as an actress, notably in *Lady Windermere's Fan*, in which she reappeared in 1911 at St. James's Theatre. (4) *Florence Terry* (d. 1896) played in *The Iron Chest* with Irving, and was the original Little Nell of Halliday's play. (5) *Fred Terry* (1865-1933) first appeared on the stage in 1880 under the Bancrofts. Together with his wife, Julia Neilson (q.v.), he played in *Sweet Nell of Old Drury*, *Hyppatia*, *As You Like It*, *The Scarlet Pimpernel*, *Henry of Navarre*, etc. His daughter *Phyllis Neilson-Terry* (b. 1892) became well known as a Shakespearian actress.



Topical Press

DAME ELLEN TERRY

**Terry, Dame Ellen Alicia** (1848-1928), Eng. actress, b. at Coventry, daughter of Benjamin T., an actor. She made her first appearance on the stage as the boy Marullius in *The Winter's Tale* in 1856 at the Princess's Theatre under the management of Charles Kean. In the same company she played Puck in *Midsummer Night's Dream* and Arthur in *King John*. In 1863 she played in various companies in London, including the role of Beatrice in *Much Ado*. She married the painter George Frederick Watts, nearly thirty years her senior, in 1864, but they separated a year later. Ellen T. returned to the stage in 1866, at Queen's Theatre, Long Acre, where she first acted with Henry Irving; they played *Katharine and Petruchio* in Garrick's version of the *Taming of the Shrew*. In 1875 she scored

a great success as Portia in *The Merchant of Venice*, revived at the Prince of Wales's Theatre under the management of the Bancrofts. While in John Haro's company at the Court Theatre, she married E. A. Wardell (Charles Kelly, d. 1885), and won great praise for her Olivia in Wills's *Fear of Wakefield* in 1878. The same year she was engaged by Irving as leading lady at the Lyceum, where she acted constantly for thirteen years, appearing as Ophelia, Portia, Desdemona, Juliet, Beatrice, Viola, Lady Macbeth, *Katharine* (*Henry VIII.*), Cordelia, Imogen, and Volunnia (*Coriolanus*). At the Lyceum she also played the title-part in *Nance Oldfield* in 1891, Rosamund in *Becket* in 1893, and Clarisse in *Kobespierre* in 1899. She appeared with Mrs. Kendal in Trice's revival, at His Majesty's, of *The Merry Wives of Windsor*, in 1902. Her stage jubilee was celebrated in 1906. In 1907 she married James Carew, an Amer. actor. She pub. her autobiography in 1908. Among her later parts were Cecily Waynflete in Shaw's *Captain Brassbound* and Alice in Barrie's *Alice Sit-by-the-Fire*. Ellen T. was one of England's greatest actresses. Her interpretation of Portia was famous throughout the Eng.-speaking world, and most critics agree that it has never been excelled. Her exquisite voice and skilful use of gesture were perhaps best seen in her Shakespearian performances. Of these her tragic roles are best remembered, but her versatility was remarkable, and contemporaries realised the worth of her performances in Shakespearian comedy and in modern dramas. With Irving Ellen T. helped to raise the international reputation of Eng. acting; her interpretations played a considerable part in the success of the Shakespearian revival. Her influence, particularly in tragedy, has not decreased since her death. In addition, she strongly supported the Women's Suffrage movement. She received sev. honorary degrees, and in May 1922 the Grand Cross of the Order of the Brit. Empire. See E. Gordon Craig, *Ellen Terry and her Secret Self*, 1930; E. Craig and C. St. John (eds.), *Ellen Terry's Memoirs*, 1932; and C. St. John (ed.), *Ellen Terry and Bernard Shaw: a Correspondence*, 1931.

**Terschelling**, one of the W. Frisian Is., in the prov. of N. Holland, Netherlands. It is 16 m. long and 3 m. broad. Hoorn and Westerschelling are the chief vils. Fishing is the prin. industry. Pop. 3600.

**Tertian Fever**, see under MALARIA.

**Tertiaries**, see under FRANCISCAN.

**Tertiary**, or **Cainozoic**, in geology, system which includes all the sedimentary accumulations formed between the close of Cretaceous time and the beginning of the Glacial Period. T. strata are divided into four systems, viz. Eocene, Oligocene, Miocene, and Pliocene, according to the percentages of recent molluscs contained. The strata are of great lithological variety, and are found in the structure of all the continents and their great mt. chains. The Alps, Himalayas, Atlas, Carpathians, and Cordillera were formed in T. times. The T. crust movement was accompanied

by volcanic action ranging from Auvergne to the Carpathians and through the Mediterranean. The volcanoes of the Andes, Iceland, and Japan first became active about this time. During the deposition of the T. strata, older forms of life became extinct and their place was taken by the present-day species of animals and plants. The climate of the period was at first warm and moist, but gradually became colder, and culminated in the glacial periods of the Pleistocene. During the first inter-glacial period of the Pleistocene, traces of humanly made artifacts are first found in Europe, but near-human tool-users are thought to have existed in the Pliocene. See also EOCENE; OLIGOCENE SYSTEM; MIOCENE; PLEIOCENE.

**Tertullianus, Quintus Septimius Florens** (c. 160-230), early Christian theologian, b. probably at Carthage. He became an advocate or rhetorician, in which profession he appears to have attained to some eminence. In all probability it was at Carthage that he was converted to Christianity, and upon his conversion he was ordained a presbyter, though where we are not told. He himself speaks of having been at Rome, and it is known that he could write Gk. His conversion probably took place about 190. About the end of the second century he became a Montanist. Jerome ascribes this change to his suffering from the envy and insults of the clergy of the Rom. Church, but a more adequate and more probable reason for it is to be found in the character of T. himself. T. holds one of the first places among the Lat. fathers for learning and intellectual power. His writings are apologetic, practical, and doctrinal. The *Apology* was written at Carthage, probably in the reign of Severus, and contributed largely to the better understanding of the character of Christianity and the mitigation of persecution. The best ed. is that in the *Vienna Corpus Scriptorum Ecclesiasticorum Latinorum*, vol. xx. (1890). See R. E. Roberts, *The Theology of Tertullian*, 1924; J. Morgan, *The Importance of Tertullian in the Development of Christian Dogma*, 1928; and T. Brand, *Tertullianus Ethik*, 1929.

**Teruel**: 1. Prov. of N.E. Spain, with an area of 5720 sq. m. It is extremely mountainous, the highest point being Mt. Javalambre, in the S (6568 ft.). It has sev. large rvs., the prin. being the Tagus, Guadalquivir, and Guadaloupe. Chief products are corn, oil, wine, fruits, timber, etc.; and industries are mainly agriculture, mining, and weaving. Pop. (1947) 237,200. 2. Cap. of above, situated on the l. b. of the Guadalquivir. It is connected by rail with Valencia. It is a small Aragonese city, retaining much of its medieval plan, enclosed by a wall. The cathedral dates from the sixteenth century. When the civil war of 1936 broke out T. sided with the Nationalists, but the Republicans captured it after fierce fighting in Dec. 1937. It was recaptured by Franco in Feb. of the following year. Pop. 14,400.

• **Terza Rima**, It. rhyme scheme in which the second line of each tercet rhymes with

the first and third of the next tercet, imitated from Dante's *Commedia*. Wyatt was the first in England to use T. R. The form *aba, bcb, cdc* shows that it is continuous in movement; thus in Shelley's *Triumph of Life* the closing line of the stanza rarely coincides with the end of a sentence; and further instances may be found in Byron's *Prophecy of Dante*, though in his *Francesca of Rimini* he avoids the interlocking of stanzas, as does Browning in *The Statue and the Bust*. See E. Smith, *The Principles of English Metre*, 1923.

**Teschen** (Polish, Cieszyn; Czech, Tesin), formerly one tn. in the Austro-Hungarian Empire, 50 m. S.E. of Troppau, on the R. Olsa. Peace was made here between Austria and Prussia in 1779. The area around it, known also as T., was in medieval times an independent principality. In 1625 both duchy and tn. fell to Bohemia, passing to Austria in 1723. Remains of the old tn. include the ruins of a twelfth-century castle. In 1920 the dist. was divided between Poland and Czechoslovakia, the line running through the tn., thus creating, for political purposes, two tns. Czechoslovakia ceded her section to Poland in 1938, but regained it after the Second World War. The div. had always been bitterly resented by the Poles, who contended that they should have had the whole dist., and the Czech Gov. granted Poles in Czech T. certain rights in 1947 which were extended under the Communist Gov. Czech T. had a pop. of 10,600 in 1937, textiles being the main industry. Manufs. in Polish T. include paper, furniture, timber, clocks, metal-work, and machinery. There are coal-mines in the dist. Pop. 15,000. The dist. of T. has an area of 350 sq. m.

**Tesho, or Teshu Lama**, see under LAMAISM.

**Tessenderloo**, tn. in the prov. of Limbourg, Belgium, 15 m. N.W. of Hasselt. It is the seat of an important chemical industry. In April 1942 a heavy explosion destroyed the tn., and as far as Antwerp, about 33 m. away, shop windows were smashed by the blast. Pop. 8000.

**Tessin**, see TICINO.

**Test**, riv. of Hampshire, England, rising near Ashe. Stockbridge and Romsey are the largest places on its banks. It enters Southampton Water. Length 30 m.

**Test Acts**: 1. By the Test Act, 1673, all office-holders of the Crown, civil and military, were obliged within six months after appointment to make a declaration against transubstantiation, take the sacrament in accordance with the ceremony of the Church of England, and take the oath of supremacy. This Act was usually conjoined with the Corporation Act, 1661, which compelled all holders of municipal offices to take the sacrament, a provision aimed at both Presbyterians and Rom. Catholics. Lord John Russell in 1828 carried a motion for their repeal. 2. The Parliamentary Test Act of 1678, which was passed after the perjured evidence of Titus Oates, and repealed in 1829. It

prohibited Rom. Catholics from sitting in Parliament.

**Testament**, *see under* BIBLE.

**Testament**, *see* WILLS and TESTAMENTS.

**Testamentum Domini**, book of church order belonging to the same class of writings as the Apostolic Constitutions. Its date is somewhere between c. A.D. 350 and the fifth century, and its place of origin probably Asia Minor.

**Testes**, **Testicles**, or (in the U.S.A.) **Spermaries**, reproductive organs (gonads) of the male animal, in which are manufactured the reproductive cells (spermatozoa or sperms) whereby the eggs are fertilised. There is usually a single pair of T. in each individual.

**Testimony**, *see under* DECLARATIONS OF DECEASED PERSONS.

**Testing Clause**, in Scots law, technical name for the clause in written deed or other formal legal instrument which authenticates the document according to the forms of law. It contains the name and designation of the writer of the instrument, a record of the number of folios of which it consists, and the names and designations of the witnesses to the writer's signature.

**Testing, Electric**, *see under* ELECTRICITY.

**Testing of Metal**, *see under* METALLURGY.

**Test Matches**, *see under* CRICKET.

**Test-papers**, paper slips impregnated with some chemical reagent. Litmus papers are used for testing for acids and alkalis, acids turning the blue variety to a red colour and alkalis turning the red papers to a blue. Paper containing lead acetate is used as a test for hydrogen sulphide, which turns it brown. Oxidising agents, such as chlorine, ozone, etc., are tested for with papers containing potassium iodide and starch, which are turned blue by their presence. Turmeric paper, yellow in colour, is used as a test for alkalis and boric acid, which cause it to become brown.

**Testudinaria**, *see* ELEPHANT'S FOOT.

**Testudo**, technical name applied to a Rom. military formation which was used when attacking fortified positions. The soldiers who were attacking raised their shields well above their heads and interlocked them.

**Testudo**, *see* TORTOISE.

**Tetanus**, or **Lockjaw** (from Gk. *tetaino*, to stretch), infectious disease characterised by violent muscular contractions. The cause of the disease is the introduction into a wound of the *Bacillus Tetani*. The existence of this micro-organism was demonstrated by Nicolaier in 1885, but a pure culture of it was first obtained by the Jap. scientist, Kitasato, in 1889. The germs are not themselves carried away in the blood-stream, but they set free toxins of poisons of unparalleled virulence, production of a drop of a cultivated example having been known to kill a mouse. The toxin acts upon the cells of the central nervous system, and the voluntary muscles are very quickly out of the control of the sufferer. The bacillus of T. is found in soil, animal excrement, etc., and it obtains an entrance to the body through a wound which has become contaminated

with dirt. There is no truth in the supposition that wounds in the thumb are particularly liable to set up T. The duty of cleaning a wound which has come into contact with soil should never be neglected, as the development of the injurious toxin proceeds with fatal rapidity. The first sign of the disease is a feeling of stiffness at the back of the neck and difficulty in swallowing; the muscles of the jaw are then affected, with the result that the mouth is opened with difficulty, and afterwards becomes closely shut. The stiffening of the muscles proceeds to the body and limbs, until parts of the body become absolutely rigid to the touch. Besides the constant rigidity, there occur convulsions at intervals which may be as short as 10 min. The muscles are then contracted with such violence that they may become ruptured or lead to the fracture of a bone. The absence of complete relaxation serves to distinguish lockjaw from the spasms associated with strychnine poisoning. The treatment of T. should commence with an effort to make the wound surgically clean. Morphine or chloroform should be used to lessen the pain caused by the spasms. T. antitoxin has been found useful as a prophylactic, but when a patient has been demonstrably attacked the development of the toxin has usually proceeded too far for any injection treatment to be of avail. Curare ('arrow poison') is useful, since it relaxes the muscles.

A considerable measure of success attended the results of inoculation with anti-T. serum of troops during the First World War. T. is much more likely to be fatal if it occurs soon after a wound than if its onset is delayed. Thus an onset within a week of wounding gave a death rate of 60 per cent, whereas when the onset was delayed to thirty-six days, the rate was only 15 per cent. In the Second World War T. was a relatively rare disease. *See paper by Sir D. Bruce, chairman of the War Office Committee on T., pub. by the Research Defence Society, 1920.*

**Tetanus** (in horses), *see under* HORSE (DISEASES).

**Tetany**. The syndrome to which this name is given is characterised by localised neuro-muscular irritability, manifesting itself, in typical cases, as a carpopedal spasm, i.e. a tonic spasm of the hands and feet, in which the hands assume the so-called accoucheur position (fingers and thumb approximated), the arms are held close to the body, the knees are flexed, and the feet are in the equinovarus position. In severe cases all the muscles of the body may be affected. It is frequently associated with *tetanystridulus*. It may result from (a) disease or damage to the parathyroids (the latter may occur in very radical operations on the thyroid); (b) disturbances of calcium metabolism; (c) alkalosis (e.g. following over-administration of alkalis in cases of peptic ulcer); (d) hyperventilation, either voluntary, hysterical, or after exercise. In children it usually occurs in association with rickets, when the deficient absorption of calcium is due to lack of vitamin D.

It may occur in cases of pyloric stenosis with vomiting, chronic diarrhoea, chronic interstitial nephritis, high intestinal obstruction, and in certain cases of poisoning, e.g. by arsenic, lead, chloroform, and morphine. Treatment, which should include that of the associated condition, consists of administration of parathormone and calcium, either by the mouth or intramuscular or intravenous injection.

**Tetbury**, mkt. tn. and par. of Gloucestershire, England, 10 m. S.W. of Cirencester, and 8 m. from Stroud, on the W. region of the Brit. Railways. It is a centre of the agric. trade. Pop. (rural dist.) 8700.

**Teternikov, Fedor Kuzmich**, see SOLOGUB.

**Tethmosis**, see THOTHMES.

**Tethys** (Τηθύς), in Gk. mythology, was the daughter of Uranus and Gæa, and the wife of Oceanus, by whom she was the mother of the Oceanides and the riv.-gods. She was also the instructress of Hera.

**Tethys**, one of the satellites of Saturn. Mean distance from the centre of Saturn is 183,200 m. Its periodic time is 1 day, 21 hrs., 18 min. Stellar magnitude at mean opposition distance, 11.7.

**Tetrabelodon**, see MERTHERIUM.

**Tetrachord**, see under HARMONY.

**Tetragrammaton**, see under JEHOVAH.

**Tetrahedron**, see under POLYHEDRON.

**Tetrao**, see BLACKCOCK; CAPERCAILLIE; GROUSE.

**Tetraroh**, ruler over the fourth part of a country. The term was borrowed by the Romans from the Gks., with whom, however, it had quite a different meaning. On the death of Herod the Great, his dominions were divided among Archelaus, Herod Antipas, and Herod Philip. Part remained under the direct rule of a Roman procurator.

**Tetrazzini, Luisa** (1871-1940), It. soprano, b. in Florence. She studied with her sister Eva, and with Ceccherini at the Florence Liceo Musicale. She made her first appearance at Florence in 1895. Later she toured Europe, Mexico, and S. America. In 1904 she appeared in San Francisco. She appeared in London at Covent Garden in 1907, as Violetta in *La Traviata*. She later went on sev. other concert tours in Europe and America. Her expressive coloratura fitted her to highly dramatic parts, and she achieved particular successes in the title-part in *Lucia di Lammermoor*, and as Anna in *La Sonnambula*. In 1921 she pub. her reminiscences, *My Life of Song*.

**Tetridopyrrol**, see IODOLK.

**Tetryl**, powerful explosive, formula  $C_7H_5O_6N_4$ ; melting point 129.1° C. Obtained by nitrating pure dimethylaniline with nitric and sulphuric acids below 55° C. and washing and crystallising from benzene. It burns smoothly, but detonates violently on striking. Also used as a detonant, usually admixed with chlorates or perchlorates.

**Tetschen**, Ger. name for Děčín Podrušký, tn. of Bohemia, Czechoslovakia, 83 m. N.N.E. of Prague, on the r. b. of the Elbe opposite Podmokly. It is an industrial tn. and a large riv. port. Pop. 30,700.

**Tettenhall**, urb. dist. in Staffordshire,

England, 2 m. from Wolverhampton. The original Wrottesley Hall which was a fine example of early eighteenth-century architecture was destroyed by fire in the early part of the present century, but was subsequently rebuilt. The Wrottesley family has owned a residence here since the twelfth century. The dist. possesses two open spaces known as the Upper Green and the Lower Green, the maintenance of which are vested in the council. The old collegiate church of St. Michael and All Angels was also destroyed by fire on Feb. 3, 1950. This church was a 'Royal Free Chapel' of Saxon foundation and must have been in existence from about the year 975. T. College is a Free Church public school, incorporated in 1915.

**Tetuan, Duke of**, see O'DONNELL. LEOPOLD.

**Tetuan**, tn. of Morocco, on the Mediterranean, 40 m. S.E. by E. of Tangier, and a few m. S. of the strait of Gibraltar. The tn. is surrounded by walls and includes a citadel. The chief industries are tile works and inlaying. Here resides the Sp. high commissioner who administers the Sp. zone of Morocco. Pop. 49,500.

**Tetzel, Johann** (c. 1465-1519), Ger. Dominican friar, b. at Pirna. By the scandalous manner in which he carried on the traffic in indulgences T. roused Luther to precipitate the Ger. Reformation in 1517. T. was later discredited and retired to a monastery. See life by F. Koerner, 1880; also G. Buchwald, *Unbekannte Predigten von Tetzel*, 1930.

**Teucer**, see under TROY.

**Teutoburger Wald**, range of hills in N.W. Germany extending along the borders of Hanover and Westphalia and through Lippe. The greater part of the chain is densely wooded. Volmersted, in Lippe, is the highest peak (1542 ft.). It is reputed to be the scene of the battle (A.D. 9) in which Arminius and the Ger. tribes defeated the Rom. legions under Quintilius Varus. There are sev. spas. Coal, iron, and zinc deposits are found.

**Teutonic Knights**, one of the great semi-religious orders of knights founded during the period of the crusades. The order originated in a brotherhood formed by certain Ger. merchants of Bremen and Lübeck to alleviate the sufferings of the attacking troops during the siege of Acre in 1190. A hospital was started, and as a result the T. K. of the Hospital of St. Mary of Jerusalem were founded. The new order, distinguished by a white mantle with a black cross, was formed on the model of the Knights Hospitallers, and its members were also pledged to tend the sick, to protect the Church, and to wage war against the heathen. In 1198 the hospital was turned into an order of knighthood. The T. K. conquered Lithuania and the Baltic regions of Prussia during the thirteenth and fourteenth centuries. For a century their headquarters were at Acre (1191-1291), but the seat of the order was transferred to Marienburg in 1308. Their defeat at the hands of the Poles and Lithuanians at Tannenberg (1410) struck a great blow at

their prestige and the order declined rapidly. It had already departed from its original moral standards. In 1525 the 'high master,' Albert of Brandenburg, was converted to Protestantism, and the order was secularised. It was suppressed by Napoleon in 1809.

**Teutonic Languages**, equivalent term for Germanic languages. *See* under INDO-EUROPEAN LANGUAGES.

**Teutons (Teutones)**, Germanic tribes who came into prominence in the last centuries B.C. The name T. was afterwards applied to the Ger. peoples generally, including the A.-S. The earliest accounts we have of the T. come from Rom. times. Julius Cæsar praised their bravery in battle, and Tacitus described their tribal customs. During the last two or three centuries B.C., the T. appear to have been pressing the Celtic peoples across the Rhine. This movement was stopped by the Romans, who invaded their ter., and estab. a military frontier along the Rhine and the Danube, but the tribes living beyond these rivs. were never subjected to Rom. rule. In subsequent centuries various teutonic or Germanic tribes overran most of Europe. *See* also MYTHOLOGY, *Teutonic Mythology*. *See* G. Schulte, *Our Forefathers*, 1929, and C. S. Elston, *Earliest Relations between Celts and Germans*, 1934.

**Toverone**, *see* ANIO.

**Teviot**, riv. in Roxburghshire, Scotland, rising in the S.W. and following a N.E. course of about 40 m., joining the Tweed at Kelso. It has good salmon and trout fishing. The valley it drains is called Teviotdale.

**Tew, Great**, vil. in Oxfordshire, England, picturesquely situated in a valley of the wolds near Deddington and 5 m. E. of Chipping Norton. The groups of dwellings in yellow local stone were nearly all built in the mid or late seventeenth century. When the Royalist peer Lucius Cary, second Viscount Falkland, inherited the property in 1625 he found the medieval vil. in a state of poverty and disrepair, and set on foot the reconstruction of the entire vil., so that G. T. became one of the earliest existing examples of a planned vil. During the first years of the eighteenth century the vil. again fell into disrepair. The subsequent planning of the estate generally on landscape and ecological principles suggests that it was carried out by John Loudon (*q.v.*).

**Tewkesbury**, municipal bor. and mkt. tn. in Gloucestershire, England. It is situated on the Avon, close to the point where that riv. joins the Severn, 10 m. N.E. of Gloucester. The 'Bloody Meadow' on the S. side of the tn. was the site of the battle of T., May 4, 1471, one of the bitterest battles of the Wars of the Roses, in which the Lancastrians were routed. T. was settled in Rom. times and in 1087 was a bor. and market. Its most magnificent building is its abbey church, all that is left of a great Benedictine abbey, erected in the twelfth century on a Saxon foundation. Monuments include Beauchamp Chantry (1425) and the tomb of Hugh Despenser (*d.* 1349). Prince

Edward, son of Henry VI., is reputed to be buried under the tower. T. has a sixteenth-century grammar school and sev. old timbered houses. In Tudor times it was famous for mustard making; now it is an agric. centre. Mrs. Craik's *John Halliday, Gentleman* is set in T. Pop. 5100.

**Tewpatoria**, *see* EUPATORIA.

**Texarkana**, name given to two cities which are adjacent, one being the co. seat of Miller co., Arkansas, U.S.A., and the other of Bowie co., Texas. The chief articles of trade are lumber, cotton, cotton-seed, and oil, while machinery, furniture, and railway engines are the chief manufs. Pop., T. in Texas, 17,000; T. in Arkansas, 11,800.

**Texas**, 'the Lone Star State,' the southernmost of the central states of the U.S.A. and the largest (263,641 sq. m.) in the Union, with a coast-line along the gulf of Mexico, stretching for 370 m. from Mexico N.E. to Louisiana. It is more than three times as large as Great Britain. Its extreme length is 760 m. and extreme breadth 620 m. It is separated from Mexico, on the S.W., by the shifting Rio Grande; New Mexico and Mexico border it on the W., Oklahoma and New Mexico on the N., and Arkansas, Oklahoma, and Louisiana on the E. The general slope is N.W. to S.E. The 'Llano Estacado' is a barren plateau in the W., with a mean elevation of from 3000-5000 ft. The descent to 1000 ft. is swift, and then come the fertile tracts of rolling prairie, with plentiful forests of yellow pine in the E., and with fat pastures alternating with rich corn lands—tracts which extend terracewise to the fertile lowlands and barren swamps of the coastal belt. Behind Padre Is., which hugs the shore for over 100 m. northward from the mouth of the Rio Grande to that of the Nueces, is a region of white sands, known as 'the desert.' With the exception of the Iro and Canadian, which carry their waters eastward to the Mississippi, all the rivs., including the Brazos, Colorado, and Trinity, drain S.E. to the gulf of Mexico. T. is too large to enjoy a uniform climate, and it has extremes ranging from temperate to sub-tropical. The air in the W. is remarkable for its dryness. T. is one of the great granaries of the world, and one of the chief agric. states of the Union. Its agric. potentialities are indeed enormous, vast areas of available arable land not yet being under cultivation. Since 1930 the problem of soil erosion, from both wind and water, has been increasingly studied. In 1939 a Soil Erosion Act was passed. Since then about 150 soil-conservation dists. covering approximately 136,000,000 ac. have been estab. In 1939 nearly half the irrigable land in T. was irrigated. Results of such care include the 'Magic Valley' of the Lower Rio Grande, formerly almost desert, where citrus fruits and vegetables are now grown. T. leads all the states in value of agric. crops per annum. Maize, oats, wheat, and rice are important crops. Cotton is of great importance, T. producing about a seventh of the world's supply. Other agric. products are fruit

(especially peaches, oranges, and grapefruit), potatoes, sweet potatoes, and other vegetables, peanuts, and sorghum. Much of T.'s farming is done by large-scale, highly mechanised, commercial farms, which now form a majority, though a large number of small farms still remain. Stock-raising is of vital importance, T. being one of the great cattle states. It raises over 20,000,000 head of live-stock, including cattle, swine, sheep, horses, and mules. Petroleum is the most valuable mineral product, representing nearly half the U.S. total output. The outputs of clay, coal, and Portland cement are also considerable. Lignite, sulphur, natural gas, quicksilver, and silver are also present, and in the W. are great potash fields, as yet unexploited. It produces over 70 per cent of all the sulphur in the U.S.A. T. is the only source of helium in the country. Slaughter-houses and meat-packing stores, and after them flour and grist mills, are profitable industries. But lumbering and timbering, cotton mills, and the manuf. of cotton-seed oil and cake are very thriving, whilst iron founding and the making of machinery and cars as well as rice cleaning are making T. an increasingly industrial state, a process accelerated by the building of war plant and 'new tns' to house their workers during the Second World War. Much of the labour is done by Mexicans, some of the frontier tns. having a pop. half Mexican.

Education is compulsory between seven and sixteen years of age. In 1948 increased educational provision was made for Negroes. There are seventy-eight listed institutions for higher education, including ten for Negroes. Chief religious bodies are the Rom. Catholic, S. Baptists, S. Methodists, and Negro Baptists. Segregation of white and coloured races is statutorily enforced. The state has good harbour facilities and has over 1000 m. of navigable waterways. There are over 17,000 m. of railways and over 27,000 m. of state highways. In 1950 T. had more than 600 airfields. The Houston Ship Canal, 30 m. long, connects Houston with the gulf of Mexico, making that city the largest inland cotton market in the world. Galveston is connected with the mainland by a causeway 2 m. long. The cap. is Austin, pop. 88,000, where T. State Univ. is situated. Other large cities are Houston, 495,000 (1940 census, 384,000); Dallas, 478,000 (294,700); San Antonio, 400,000 (253,900); Fort Worth, 271,000 (177,600); El Paso, 135,000 (96,800); Corpus Christi, 125,000 (57,300). Galveston has a pop. of 60,800. Increased industrialisation during the Second World War accounts for much of the large increase in T.'s city pops.

The Sp. explorers De Vaca and Coronado (q.v.) were the first to explore the region now known as T. (the name was that of an Indian tribe), but the first permanent settlement was made by La Salle in 1685 at Fort Saint Louis. T. was surrendered by the Fr. to the Sp. in 1713, who founded many religious missions. These contributed greatly to the conversion of T. not only to Christianity, but

from a waste land into a civilised country. When Mexico revolted and became independent in 1821, Coahuila and T. formed one state. T. was colonised to a large extent by Amers. and Eng., and when trouble broke out with the Mexican Gov., T. was constituted an independent republic in 1836. In 1845 it sought and gained admission as a state of the U.S.A. After the Mexican war, which was precipitated by this admission, T. prospered. In 1861 it seceded with the S. states. The legislature consists of a Senate of thirty-one members and a House of Representatives of 150. Two senators and twenty-one representatives attend Congress. Pop. 6,414,824 (census 1940); estimated (1948), 7,230,000. See C. R. Wharton, *History of Texas*, 1935; R. N. Richardson, *Texas*, 1943; J. Frank Dobie, *A Vaquero of the Brush Country*, 1949.

**Texas City**, port of Texas, U.S.A., on the bay of Galveston, 5 m. N.W. of Galveston city. In fifty years it has grown from a hamlet into one of the U.S.A.'s largest ports, dealing with rather more trade than San Francisco. A severe explosion on a ship in T. C. harbour in 1947 killed over 600 people and destroyed much of the city. Pop. 28,000 (5700 according to 1940 census).

**Texcoco**, see **TEZCUICO**.

**Texel**, one of the Dutch W. Frisian is., covering 71 sq. m., separated from the mainland by the 2-m.-broad Marsdiep and opposite the tn. of Den Helder. At one time it was joined to the is. of Vlieland and the foreshore beyond. The N. part of the is. is called Ederland or Eger Land from the bird observatory erected in this part of the is., where thousands of birds belonging to more than a hundred species breed every year. Of late years the is. has been much frequented by tourists, and by holiday-makers as a camping centre. In 1945 it was liberated by the Russian prisoners-of-war who had been quartered there. The whole is. forms one municipality: the inhab. live by sheep-breeding, agriculture, and fishing. There are considerable exports of lambs to England. T. ewe-cheese is famous as a Dutch export. The farmhouses on T. have a peculiarly square shape, with tall pyramidal roofs (*stolpen*). It was off T. in 1653 that an Eng. fleet under Monck beat a Dutch fleet under Tromp, who was killed during the battle. Pop. 9400.

**Textiles**, see **FABRICS**, **TEXTILE**. See also under **CLOTH MANUFACTURE** and **FINISHING**; **COTTON SPINNING** and **MANUFACTURE**; **WOOL**.

**Tezucuo**, or **Texcoco**, tn. in Mexico, situated near Lake T. It is an old city and was originally the centre of the Aztec culture, some of its old buildings still remaining. Pop. about 25,000.

**Tezeu**, or **Tezewo** (Ger. *Dirschau*), tn. of Poland on the l. b. of the Vistula, about 20 m. from Gdansk (Danzig). It has sugar factories and railway works. Pop. 16,000.

**Tezuitlan**, tn. in the state of Puebla, Mexico. Pop. 12,000.

**Thackeray**, **William Makepeace** (1811-1863), Eng. novelist and essayist, b. in



Calcutta. His father, Richmond T., was in the service of the East India Company. He died in 1815, leaving his son an inheritance of nearly £20 000. T. was sent to England to school in 1817, and was educated at the Charterhouse, London, and at Trinity College, Cambridge, where he was a friend of Fitzgerald and Tennyson. He left the univ. after a year and travelled in Germany, staying chiefly at Weimar. In 1831 he entered the Middle Temple, but did not long pursue his legal studies. He spent much of the following year in Paris, and in 1833 became part owner of a weekly paper, the *National Standard*. The paper came to an end in the following year, when its losses were borne by T. The remainder of his patrimony disappeared with the failure of an Indian bank in 1833. He was at this time in Paris studying art. He now hoped to earn his living as an illustrator, and in April 1836 pub. *Flore et Zephyr—Ballet Mythologique*, a set of eight plates. In Aug. he married Isabella Shawe. Shortly after he became Paris correspondent of the daily newspaper, the *Constitutionnel*. This also failed, and in March 1837 he returned to London, where his daughter Anne Isabella, later Lady Ritchie, the eldest of his three children, was born. To this period belong his contributions to *Fraser's Magazine*, including the *Yellowplush Correspondence* (1837-38) and *Catherine* (1839-40). Shortly afterwards his life was permanently clouded by his wife's insanity. The *Paris Sketch Book* followed *Catherine* in 1840 but was unsuccessful. This was followed in 1841 by *Comic Tales and Sketches*, collected periodical writings, which revealed the two pseudonyms 'Yellowplush' and 'Michael Angelo Titmarsh' as the same person. In 1842 he visited Dublin and *The Irish Sketch Book* appeared in 1843. His friendship with Mrs. Brookfield, begun in 1842, marked by a correspondence extending over many years, was one of the major influences of his life.

At this time recognition as a writer was slow in coming. *The Great Hogarty Diamond* was refused by *Blackwood's Magazine* and appeared serially in *Fraser's* (1841), as also did *Barry Lyndon* in 1844. This was one of his greatest works, excelling in irony and brilliant wit. Since 1842 he had contributed regularly to *Punch* and increased his reputation with *The Book of Snobs* which appeared in *Punch* (1846-1847). Mrs. Perkins' *Ball* (1846), a 'Christmas Book,' brought him further popularity, but he did not become really famous until the pub. of *Vanity Fair*, which was brought out in monthly parts from Jan. 1847 to July 1848. The first ed. in one vol. was pub. in 1848. Its success was slow at first. As soon as it was finished he began work on *Pendennis*, and the first of twenty-four monthly parts appeared in Nov. 1848. These two works placed him in the front rank of living novelists. In 1851 he resigned from the *Punch* staff in order to devote himself to the writing of *Esmond*, which was pub. in Oct. 1852. The same month he sailed to America, where he gained a great success

with his lectures on *The English Humorists of the Eighteenth Century* which had been delivered in London and the provs. the previous year. *The Newcomes* was pub. in monthly parts from Oct. 1853 to Aug. 1855. While it was coming out *The Rose and the Ring*, a delightful extravaganza, appeared (1854). In 1855 T. repeated his Amer. success, travelling widely and lecturing on *The Four Georges*. These lectures were also given in England and Scotland on his return from America in 1856. The following year he unsuccessfully contested Oxford in the Liberal interest. *The Virginians* came out in 1857-59, and in 1860 T. became first editor of the *Cornhill Magazine*, to which he contributed *Lovel the Widower* (1860), *The Adventures of Philip* (1861-62), and the delightful *Roundabout Papers* (1860-1863). He resigned the editorship in 1862. At the time of his death he was engaged upon *Denis Duval*, the fragment of which has been pub. (1864).

T. has been hailed by many critics as the lineal literary descendant of Henry Fielding (*q.v.*), and as only second to him as an Eng. novelist. In temper and style he had inherited much of the eighteenth-century literary tradition; but his work shows a blending of many influences, and he really stands apart from any of the other great novelists of his own or the previous century, though possessing characteristics of sev. His writing is finely seasoned with a highly developed wit and irony, as polished and sustained, on occasion, as that of Swift or Pope, but without their bitterness.

Collections of T.'s works include those by Lady Anne Ritchie (13 vols., 1898-99). The ed. by Lewis Melville (20 vols., 1901-7) is complete and has all the original illustrations. T. was one of the greatest of Eng. letter writers, and his correspondence has been pub. in various forms. The earliest collection appeared in 1887 and contained letters written to Mrs. Brookfield, 1847-55. Other collections include *Letters and Private Papers of W. M. Thackeray*, ed. by G. N. Ray, in 4 vols. (1945). There is an important biography by Lewis Melville (1899; repub. in an enlarged ed. with bibliography in 1909 and 1927). See also A. Trollope, *Thackeray* ('English Men of Letters' series), 1879; G. Saintsbury, *A Consideration of Thackeray*, 1931; M. Elwin, *Thackeray, a Personality*, 1932; and L. Stevenson, *The Showman of Vanity Fair*, 1947.

Thaddæus, see JUDAS.

Thailand, see SIAM.

Thaler, abbreviation for Joachinsthaler, silver coins coined at Joachimssthal, Bohemia, in 1519. From 1857 to 1873 the T. was the unit of the Ger. monetary union, being equivalent to 3 marks, but after this it fell into disuse. The word dollar is derived from T.

Thales (fl. 600 B.C.), Gk. philosopher, chief of the seven wise men, b. at Miletus. He taught that water or moisture was the one element from which all things evolved. He appears to have owed much to the astronomy of the Egyptians and to the civilisation of Mesopotamia. He is

regarded as the founder of abstract geometry, of the strict deductive form as shown in Euclid's collections; he is said to have shown how to calculate the distance of a ship at sea, and the heights of objects. In astronomy he was credited by the ancients with the prediction of the total solar eclipse identified by Airy, Zech, and Hind with the date May 28, 585 B.C.; he is said to have noted the 'Lesser Bear' and to have shown its superiority for the purposes of navigation.

**Thalia**, one of the nine Muses (*q.v.*).

**Thallium**, metallic chemical element, symbol Tl, atomic number 81, atomic weight 204.2. It was discovered by Crookes (1861) in the seleniferous deposits from the sulphuric acid manufactory. It occurs in small quantities in iron pyrites, and also occurs associated with copper, silver, and selenium in the mineral 'crookesite.' The metal is prepared by displacement from its solutions by means of zinc. T. compounds give a bright green line in the spectrum (hence the name, from Gk. *thallos*, a green twig); some of them find a use in the manuf. of optical glass.

**Thame**, murt. tn. and urb. dist. of Oxfordshire, England. It is situated on the R. T., 13 m. from Oxford and 45 m. from London. Its chief building is the church of St. Mary the Virgin, which is an exceptionally large church in mainly Early Eng. and Perpendicular style, containing some interesting brasses. It has a sixteenth-century grammar school and a famous inn known as the 'Spread Eagle.' The R. T. has its source in the Chiltern Hills and flows past T. to the Thames, which it joins near Dorchester. It is 35 m. long. Pop. 3600.

**Thames**, riv. of Canada, which flows across the Lakes Peninsula in Ontario, between Lakes Erie and Huron, and into Lake St. Clair, after a course of 150 m. The chief city on it is London (*q.v.*).

**Thames**, New Zealand, *see* GRAHAMSTOWN.

**Thames and Severn Canal** leaves the Thames at Lechlade, and reaches Stroud, 30 m. N.E. The N. Wilts Canal communicates with it at Cricklade, and the Stroudwater Canal from the Severn at Stroud. It runs through the cos. of Wiltshire and Gloucester.

**Thames Conservancy**. The conservation of the Thames was granted to the lord mayor of London in 1487 and delegated to twelve conservators in 1857, the powers being reconstituted in 1894. The duties relative to the lower part of the riv. devolved upon the Corporation of London until 1857, those relative to the upper part upon the Upper Thames Commissioners until 1866, when under the Thames Navigation Act the riv. from Staines to Cucklade, in Wiltshire, was added to the conservators' jurisdiction. The Port of London Authority (*q.v.*) by an Act of 1908, took over all rights and duties of the conservators in respect of the riv. below Teddington. Since that date the conservators' powers and duties have been further amended by the Thames Conservancy Acts of 1910, 1911, 1921, and 1924,

and finally consolidated in the Thames Conservancy Act, 1932. By the Land Drainage Act, 1930, the conservators were constituted the Drainage Board of the Thames Catchment Area, and exercise jurisdiction over 2382 m. of 'main riv.,' comprising the Thames itself above Teddington and part or the whole of certain tribs. In consequence of the additional duties imposed by this Act, the number of conservators was increased in 1932 to thirty-four, each appointed by an interested authority. The whole of the riv. above Teddington Lock towards its source is exclusively governed by the by-laws of the T. C. Board. The prin. duties of the board have to do with the preservation of the riv. from pollution, both in the main stream and in tribs., docks, and canals, the protection of fisheries, the control of navigation, and drainage, etc.

**Thames Ditton**, residential dist. of Surrey, England, forming part of the urb. dist. of Esher. The Swan and Angel Hotels are sixteenth-century foundations, and there are almshouses of the early eighteenth century. Pop. 9000.

**Thames, The**, riv. of England, rises near Cirencester in the Cotswold Hills and follows a course of 210 m. to the Nore, where it debouches into the North Sea. It is England's largest and most important riv. At Gravesend, the head of the estuary, it has a width of half a mile, gradually increasing thence to 10 m. to the Nore. By the addition of its tribs., the Colne, Leach, and Churn, it becomes navigable for barge traffic at Lechlade, where the canal to the Severn leaves. At Oxford the navigability improves, and the Wilts and Bucks Canal joins a few miles down at Abingdon, the Wye Canal leaving via the Kennet at Reading. From here barge and tug traffic, with important depots at Reading and Kingston, is considerable, while riv. steamers ply between the latter place and Oxford. Tidal waters are reached at Teddington, 60 m. from the mouth, where is the first lock from the sea except for the tidal lock at Richmond. There are in all forty-seven locks. St. John's Lock, Lechlade, being nearest the source. The normal rise and fall of the tide is from 15 to 23 ft. at London Bridge and from 13 to 19 ft. at Tilbury. Until the Tower Bridge was built, London Bridge was the lowest in the course, the reach between the two being known as the Pool. Gravesend, 20 m. lower, grew up at the spot where vessels awaited the turn of the tide. A little further the Medway, by virtue of its estuary the chief trib., enters; just inside this is Chatham, the important naval depot. Opposite to Gravesend and on the N. bank is Tilbury, the terminus of many large liners. From London Bridge downwards the riv. is lined with docks and wharves. At Woolwich, on the S. bank, 8 m. below London Bridge, is the arsenal, and a little further up the riv. Greenwich with its Royal Naval Hospital. The embankments of the T. in London were the work of Sir Joseph Bazalgette (1819-91) (*q.v.*), chief engineer of the Metropolitan Board

of Works. The Albert Embankment on the S. side was completed in 1869, the Victoria Embankment from Westminster to Blackfriars in 1870, and the Chelsea Embankment from the Royal Hospital to Battersea Bridge in 1874. In Jan. 1949 work was started on a new embankment, designed by J. Rawlinson, chief engineer of the L.C.C., on the S. side from County Hall to Waterloo Bridge. The riv. is spanned by over fifty bridges, including Tower Bridge, a bascule bridge, and suspension bridges at Hammersmith and Marlow. The chief tunnels under the T. are the T. Tunnel, completed by Brunel in 1841, now used for railway only, the Blackwall Tunnel (1897) from E. India Dock Road to E. Greenwich, and Rotherhithe Tunnel (1918) from Shadwell to Rotherhithe. In 1948 a scheme was put on foot for the maintenance of the towpaths from Teddington to Cricklade as a public open space. The Port of London Authority (*q.v.*) is responsible for the control and conservation of the riv. below Teddington; above Teddington the T. Conservancy (*q.v.*) is the responsible authority.

Until the nineteenth century the London T. was an important means of transport for passengers; the names of 'stairs' are traces of the great passenger barge traffic. Since the Second World War passenger traffic on the T. has been revived by 'water buses.' The T. has been frozen over at various times, the earliest recorded occasion being A.D. 1150. See H. Belloc, *The Historic Thames*, 1914; J. H. Salter, *Guide to the Thames* (31st ed.), 1929; C. F. Smith, *The Thames*, 1931; A. Bell, *Said Noble River*, 1937; A. G. Thompson, *The Royal Thames*, 1937; R. Gibbings, *Sweet Thames Run Softly*, 1940; M. S. Briggs, *Down the Thames*, 1919.

Thana, *see* Tanna.

Thane, or Thegn, A.-S. rank, which originally seems to have been applied to the personal followers of the king and had a distinct military significance. Early *l.*s give the *werzild* (*q.v.*) of a T. as between that of a *eorl* and an *earl*. The complex society of later Saxon England suggest that the T. was no longer confined to a class of fighting nobles, bound to the king by personal loyalty, but could include successful merchants and *eorls*. It appears to have become essentially a mark of social standing. Historians no longer suggest that the Norman knight derived from the Eng. T. The Ts. did not hold their land by military tenure, but were bound to fight for their king by bonds of loyalty. They received their lands of him as a reward for past services. See Sir F. Stenton, *Anglo-Saxon England*, 1943.

Thanet, Isle of, extreme E. part of Kent which was formerly separated from the mainland by the R. Wantsum which remained in part navigable up to the end of the fifteenth century. Ebbsfleet is generally accepted as the landing place of the Saxons in A.D. 449, and in the same area St. Augustine and the Christian missionaries made landfall in 597. The is. was in the full stream of Brit. hist. for many centuries and its famous churches

bear evidence of its great importance from early times. It has exceptionally bracing air, and is now well known for its watering-places of Margate, Broadstairs, and Ramsgate, the latter being also a seaport with a busy harbour. See J. Lewis, *The History and Antiquities . . . of the Isle of Thanet* (2nd ed.), 1736.

Thanet Sands, lowest div. of the Eocene system (*q.v.*) exposed along the margin of the chalk in the E. part of the Thames Basin and particularly in E. Kent, especially in the Thanet dist. Some seventy species of marine fossils are known. Thanet sand is used for moulding; its occurrence in W. Kent determined the site of Woolwich Arsenal.

Thanksgiving Day, ann. festival of thanksgiving in the U.S.A., celebrated as a national holiday according to the choice of President Lincoln in 1864, on the last Thursday in Nov. President Roosevelt further defined the date of celebration as the fourth Thursday in Nov., in 1941. It is in essence a national harvest celebration, and was first observed by the Pilgrim Fathers at Plymouth in 1621, after they had gathered in their first harvest.

Thapsus, in anct. geography, tn. in Tunis, 30 m. S.E. of Susa. In 46 B.C. Julius Caesar here routed the Pompeians under Cato, Scipio, and Juba, so ending the war in Africa.

Thar and Parkar, dist. in the E. of Sindh, Pakistan. It divides the fertile plain of Nara and a dry region. Pop. 457,000.

Tharawadi, tn. and dist. of Lower Burma. Rice is produced. The cap. is T., 68 m. N.W. of Rangoon. Area 2851 sq. m. Pop. (dist.) 594,000; (tn.) 9000.

Thatching, art. of roofing houses or protecting stacks of hay or grain with a covering of reeds, rushes, straw, etc. Thatch should be at least 12 in. in thickness and laid to a pitch of 45 degrees. Best or true Norfolk reed is used in T. Norfolk reed with an admixture of lesser reed mace lasts longer, besides being less expensive than best reed. Wheat or rye straw is considerably cheaper than reed but may require renewal after twenty years, whereas reed thatch should last about seventy-five years. Heather also provides a durable thatch but in exposed places is liable to strip.

Thaulow, Frits (1847-1906), Norwegian painter. During his early days he was a pupil of the Norwegian romantic painter Gude; later when in Paris in the 1870s he came under the influence of Corot and Daubigny. After his return to Norway he was known for his landscape paintings which, after another period of travels abroad, matured in colouristic refinement and won him world repute. He is represented in the Nasjonalgalleriet, Oslo, and in collections in Europe and America.

Thaw, the melting of snow and ice. A partial and temporary T. may be caused by the sun's heat if it is not too low in the sky; but a permanent T., particularly in the Brit. Isles, is mostly due to a complete change of air mass, as for instance from northerly or easterly winds to comparatively warm westerly winds from the Atlantic. In northerly or cold

continental regions the 'spring T.' is a pronounced ann. event, the ice-bound seas, lakes, and rivs. breaking up and the winter snows melting.

**Thaxted**, tn. of Essex, England, 7 m. N. of Great Dunmow. It was important in medieval times, and was formerly a bor., incorporated by charter of Philip and Mary. It is famous for its massive Perpendicular church, which has a fine crotched spire (181 ft.), and is one of the finest in Essex. The guildhall in Town Street is a picturesque three-storeyed timber-framed building of mid fifteenth-century date, and is of great interest as it is one of the few remaining medieval guildhalls in England. Horham Hall is in the par. Pop. 1700.

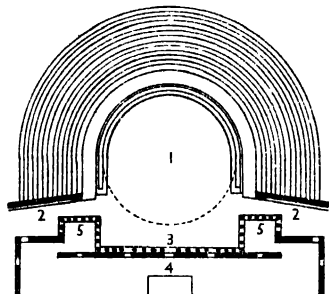
**Theatines**, Rom. Catholic religious order of priests, marked by its extreme observance of poverty. They were founded in 1524 by Gaetano del Conti (1480-1517), canonised in 1671, and Giovanni Caraffa, afterwards Pope Paul IV., with the object of restoring the standard of clerical life and recalling the laity to the practice of virtue. They exist to-day mainly in Italy. There are also Theatine nuns, founded by Ursula Benincasa in 1583.

**Theatre**, place designed for enabling an audience to see the performance of plays, consisting of a stage and an auditorium, with ancillary accommodation for actors and audience.

**Greece**.—The religious origins of the drama (*q.v.*) made it from the beginning essentially a popular art so that the T. in which it was presented had to provide ample standing and, later, seating accommodation for the participating spectators. In the earliest Ts. these simple requirements were met by a suitable hillside with a level circular space (*orchestra*) at the bottom, in the centre of which an altar was erected. The primitive Gk. T. thus assumed its shape, having seats in a slightly extended semicircle (the *theatron* or auditorium) around the orchestra. At Athens, about 465 B.C., the orchestra was moved 50 ft. forward, and on the further side a small wooden hut (*σκήνη*, *skene*) was built as a dressing-room for the actors. It had a long front wall with projecting wings towards either end, between which a stage was probably raised a foot above the level of the orchestra. This stage was possibly backed by a row of columns (*προσκήνιον*, *proskēnion*, *proscenium*), originally also of wood, behind which was the wall pierced by doors for the actors' entrances and exits. At each end of the extended semicircle of the auditorium was a passageway (*παράδοος*, *parados*), between stage and auditorium.

By the third and second centuries B.C., the chorus had practically disappeared from tragedy, and though choral odes were still retained in comedy, they had become separate interludes. The *skene* was generally two-storeyed, with a row of columns some 10 ft. in front, the spaces between filled in with painted boards, and on top a platform on which the actors performed. Immediately behind and above this was the *proscenium*, which

usually had three doors. By Græco-Rom. times the stage front and the background had been altered. The *proscenium* was more elaborate, and dominated the T. with its columns, doors (seven at Ephesus), and architectural embellishments. Spectacular scenic effects were eagerly sought. Projecting wings (*παράσκηνα*, *paraskēnia*) now formed part of the structure of the T. Low platforms carrying scenic effects could be pushed on to the stage through the doors; semicircular and triangular turntables painted with tragic, comic, and satiric designs; a hook and pulley device for lowering and raising divinities from and to the heavens; trapdoors in



A GREEK THEATRE

This diagram shows the lowest part of the auditorium and the *skene* of the Theatre of Lykurgos at Athens

1, orchestra; 2, 2, *parados*; 3, *proskēnion*; 4, *skene* 5, 5, *paraskēnia*.

the orchestra through which ghosts and spirits could appear; means of producing thunder and lightning, fires, etc., are all either recorded or to be inferred from a study of the plays. Stage costume was highly stylised. Certain conventions fully estab. by Æschylus's day remained unchanged from then till Rom. times. Although the earlier tragedies and comedies had always been set in the legendary Homeric era, the tragic actor's dress was always that of the fifth century (see under **COSTUME DESIGN, THEATRICAL**).

The Rom. T. differed from the Gk. T. first in having nothing to do with religion, and secondly in being built on level instead of sloping ground, possibly for the sake of a more imposing architectural exterior. The auditorium was an exact semicircle around the orchestra space, the further half occupied by the stage, the front half being used sometimes for additional seating accommodation and sometimes for gladiatorial or other spectacular displays, when it could be rolled off to protect the audience. The stage doors in the front wall (*hyposcēnium*) and steps down from the stage to the orchestra were usual. This wall was no longer plain but decorated in keeping with the embellishment of the *frons scenæ* at the back of the stage, from which a roof reached

out over it. Awnings over the auditorium were also provided. The earlier elaborate portals over the *paradoi* were transformed into covered passages.

Gk. tragedy and comedy introduced to Rome degenerated into dance and satirical mime, and the status of the Rom. actor never approached the dignity of that of his Gk. predecessor. In the original Gk. drama the poet himself would play the leading part and train the chorus. Actors were originally amateurs, but later companies of actors were formed with their own guild and were held in high esteem. In Rome, the custom of maintaining permanent troupes of actors, mostly slaves, and the introduction of women to the stage, made the profession generally despised.

*The Middle Ages.*—Though the Ts. were destroyed by Lombard invasion in the sixth century, the players survived. The rich had always hired them for private entertainments, and continued to do so. The barbarians, moreover, were accustomed to keep court poets to enshrine their triumphs in epic narrative. By A.D. 800 these two employments merged in the household minstrel (*menestrier*). Less fortunate actors took to the road and became tumblers, acrobats, puppet-masters, dancers, singers, masks, etc., known generally as *jongleurs*, and these with the later *goliards*, the wandering scholars (mostly defrocked clerks and students travelling between the univs.), noted for their ribald satires, formed the vast body of nomad players, the *histriones*, of the eleventh to thirteenth centuries.

The T. was reborn once more of religion, this time of the Christian liturgy and in the Church, when in the tenth century, for the benefit of the faithful who had no Lat., the clergy began to act the parts they sung, i.e. to give simple mimes of the gospel story incorporated in the mass. Short episodes of this kind at Easter and Christmas, the two most important Church feasts, grew into cycles covering the 'all stories' of the Resurrection and the Nativity. The plays became so popular that early in the twelfth century the crowds were more than the churches could hold. Performances were given in refectories and in the open—the churchyard or the market-place. The plays were arranged as they had been inside the church, the settings for each scene, wooden platforms and stages, known in England as 'houses,' erected in front and on either side of a cross in the same relative position to it as before they had been to the main altar.

On the Continent such stationary settings were the general rule, but in England, with a few exceptions, it became the practice to mount the 'houses' on wheels and tour the tn. in procession, each 'house' stopping to perform its scene at pre-arranged stages. By the thirteenth century the whole of hist. from the Creation to the Judgment was incorporated in the various cycles, and the clergy, even helped out by the wandering scholars, were unable to provide enough actors for the major festivals. The laity were thus called in to take part, and between 1350

and 1450 they gradually took over the financing, production, and entire control of all public performances.

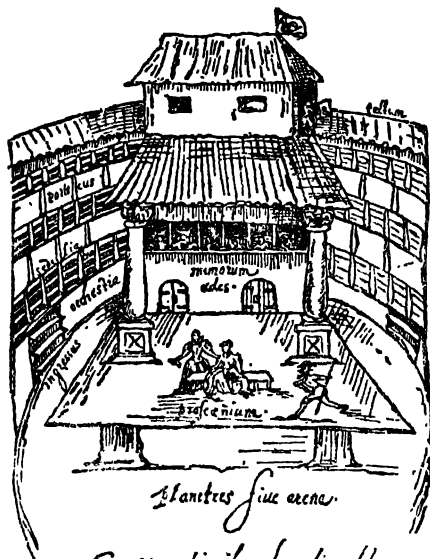
Similar conditions prevailed on the Continent, except that there the plays were also produced by companies of actors which had no counterpart in England. In France the most famous of these was the *Confrérie de la Passion*, estab. by royal patent in 1402, and the first permanent theatrical troupe to have its own T. in Europe.

*Renaissance: Italy.*—In Italy during the Renaissance companies of young men specially associating for the purpose, more after the Fr. than the Eng. manner, had taken over the miracle plays (*sacre rappresentazioni*) from the Church, while the travelling players, starting from fair-ground and street corner, had by the sixteenth century evolved the unsurpassed *Commedia dell'Arte* (q.v.). At the turn of the fifteenth century the contemporary study of perspective was applied to theatrical *décor* and a type of classicised medieval multiple-setting evolved. In 1551 Sebastiano Serlio in his *Architettura* advocated a synthesis of classical and medieval practice in a stage on which stock settings with corresponding perspective back cloths could be erected according to the play performed. These settings were constructed, like the medieval 'houses,' in canvas and lath, which would give them an appearance of solidity. The action of the play took place as in classical and medieval practice in the open (on the *platea*). The Teatro Olimpico at Vicenza, built (1580-84) to the design of Palladio, combined Rom. solidity with medieval multiplicity. A long narrow front stage was backed by an ornamental architectural proscenium, with a perspective view shown through a large central arch (the former *porta regia*), flanked on either side by small doors. The Teatro Farnese at Parma (1618-19) introduced the proscenium arch, and was also the first T. to have seats in the orchestra up to the stage. Accounts of classical 'machines' were studied and ingenious scenic effects contrived; movable scenery is first heard of at Venice in 1639. A curtain was installed, but was mostly used only at the beginning of a performance to surprise the audience by the sudden revelation of a particularly striking opening set.

*Renaissance: France.*—As Renaissance ideas reached France, medieval and classical methods were similarly though more directly combined. Fr. drama did not yet observe the unities as strictly as It., and to present the sev. settings required for each play *décor simultané* was used, as many *à l'esquisse* type 'houses' and perspectives being set up together on the stage as a play required. Scalger's comment, in 1561, that actors in France when silent were presumed not to be on the stage, is in keeping with this system of production.

*The Elizabethan Stage.*—In England the traditional drama, the new classical influence, and humanist teaching were alike dominated by the Reformation. The

first public T., known as the Theatre, was built in 1576 by an actor, James Burbage, who, to escape interference by the city authorities, chose a site at Shore-ditch outside the city walls. Within a year a second T. called the Curtain was built not far away. We know nothing about these except that they were regarded as 'sumptuous.' The Swan was built by Francis Langley about 1595.



THE ELIZABETHAN THEATRE

The Swan, on Bankside: a reproduction, reduced, of a drawing by Arend van Buchell.

A drawing of this building, made by a Dutchman, Arend van Buchell, based on a description given him by his friend Johannes de Witt of Utrecht, who visited the T. in 1596, is the earliest information we have about these first London Ts. It shows a building of three galleries, which are roofed, and in the galleries are seats; the centre is open to the sky, and there is a large platform stage; there is standing space for spectators on three sides. The drawing shows three people acting on the stage. Over the stage is a canopy, known as the heavens, which in the drawing covers only a small part of the stage, but was probably over the whole of it. At the rear of the stage there are two doors, and over them a balcony, with people in it. At the top there is a thatched room with a flag and a trumpeter. The Swan was said to accommodate in its seats 3000 persons, which was probably an exaggeration, for a large number of spectators had to stand in the pit. In

1599 there was built the most famous of all Ts., the Globe, also on Bankside. It was a handsome building, constructed of timber, plastered, with thatched roof, surpassing all the other Ts., but practically nothing is known about it except by conjecture, based upon references to the building in plays, etc., and upon the contract for building the Fortune T. shortly after, which refers to the Globe.

It is conjectured that it was 84 ft. wide between the outer walls and that the width of the pit was 58 ft. There were three roofed galleries, with three rows of seats in each. The stage was, possibly, 43 ft. long and 23 ft. wide, and extended to the middle of the pit: there was a heavens or canopy over it; at the back there were doors at each side and in the centre a curtained inner stage. Over the inner stage there was a balcony, also curtained, which may have projected. There were traps in the floor of the stage for ghosts, etc. Actors and properties could be let down from the heavens. There was one entrance to the T. for spectators and another at the rear of the stage for the actors; the 'tiring' rooms for the actors were at the rear of the stage, probably on sev. floors. The admission was one penny, increased for special performances, which entitled to standing room in the pit. Those who wanted to go into the galleries paid another penny for entrance to the gallery staircase, which allowed for a seat in the third gallery; if a seat in the first and second gallery was required a third penny would be paid. The galleries on each side of the stage contained gentlemen's boxes for a seat in which a shilling would be charged. Spectators were allowed on the stage, for which perhaps a shilling was charged. Performances were given in the afternoon, by daylight; on such a stage Shakespeare's plays were performed. There can be little doubt that the open platform stage enabled Shakespeare to do all he

wished. It was richly decorated, elaborate properties would be used, and the dressing of the actors was magnificent. Heraldry and music were important features. The Fortune T. was built by Philip Henslowe and Edward Alleyn, the actor, in the par. of St. Giles, Cripplegate Without, in 1600. It was square, 80 ft. each way, constructed of wood or a brick and tile foundation and covered with plaster. It was three storeys high. It was burnt down in 1621 and rebuilt at once, but dismantled in 1649. London was well supplied with Ts. until the Civil war put an end to all theatrical activity.

The masque was a private entertainment of an expensive and elaborate kind given in palaces or lords' houses. It consisted of scenic display, dancing, and music, in which the guests took part, and was not considered to have any relation to the T. Inigo Jones designed a building for these entertainments at Whitehall known as the Cockpit in which plays were given at the Restoration (see MASQUE).

*The Restoration Theatre.*—When Charles II. came back from exile with ideas of the Fr. and It. Ts., which were entirely different from the old Eng. T., he gave patents to Sir W. Davenant and to Thomas Killigrew to set up two companies of players, Davenant's to be his brother James's and Killigrew's to be his own, and to build Ts. They got to work at once and performed in converted tennis courts and other buildings, until Killigrew took a site in Bridges Street and in 1663 opened the first T. Royal, Drury Lane, to become one of the most famous Ts. in the world. It was a covered T. with a glass roof, benches in the pit, two galleries, a royal box at the back in the centre, and a stage rather like that of the old Ts. except that scenery in perspective could be used on it. Performances were still given in the afternoon by daylight. Then Davenant instructed Sir Christopher Wren to design a new T. for his company. This was opened as the Duke's House in 1671, and was a wonderful building, seating 1000, with an enormous gilt proscenium arch, on the top of which was situated the orchestra; the scenes were placed behind the arch, while the acting took place on the stage in front of it.

On Jan. 25, 1672, the T. Royal was burnt down and a second T., designed by Sir Christopher Wren, was opened in 1674. This T. lasted until 1791. It was rectangular, with three galleries, each with four rows of seats, the first gallery being divided into boxes; the entire floor was devoted to the benches for the pit. The stage projected 17 ft. beyond the proscenium arch; on each side there were two proscenium doors with windows over them. Neither T. was popular and in 1682 the two companies were amalgamated and played at the T. Royal, abandoning the Duke's House. There are sev. points to be noted in the Restoration T., which entirely transformed the drama and acting from what they had been in England. The first is that women appeared on the stage, for it was Charles's order that they should do so. Women had never appeared on the Eng. stage (except when a Fr. company visited London), for acting had been done by men and boys. It was part of the Puritan objection to the T. that boys dressed up as women. The appearance of actresses transformed the drama and they soon took a predominating part, often appearing in men's parts, and plays were written to exploit their charms, and movable scenery was also used. Spectacle for its own sake became one of the leading features of the T. The audience was placed further and further from the stage so as to get the full advantage of the scenes in perspective, and the apron stage became more and more reduced; then the actors were forced to play in the scenes, though for a long period, indeed until the first quarter of the nineteenth century, they insisted on using the apron too. Thus arose the 'picture-frame' stage and the convention of the 'fourth wall.' Finally the two patents granted by Charles had created a monopoly, the most effective

stranglehold upon the Ts. that could have been conceived.

*Eighteenth and Nineteenth Centuries: England.*—The heaviest blow the T. sustained was Horace Walpole's Licensing Act of 1737, which prohibited Ts. anywhere except by the authority of letters patent from the king or a licence from the lord chamberlain. Not until 1788 was this severe restriction upon building relaxed, when an Act enabled Ts. to be built under justices' licence, though it did not apply to London or 20 m. around.

In London, however, the T. monopoly continued, and there was continual rivalry between the two patent Ts. of Drury Lane and Covent Garden. They both opposed the unlicensed playhouses which had no legal right to produce legitimate drama. There was great objection to the monopoly, and in 1843 the Theatre Act was passed, which, with minor amendments, governs the T. throughout the country to-day (see under THEATRES, LAWS RELATING TO). There were in 1950 forty-two Ts. in or adjoining the W. End of London, with a number of 'private' Ts. and a number of Ts. in the suburbs. The designs of all the Ts. are largely based on Wyatt's Drury Lane, being smaller versions of what is practically a Fr. form of T. building. There are no really modern buildings in London. This applies to other cities in England; also to Stratford-on-Avon, where the original Shakespeare Memorial T., opened in 1879, was burnt down in 1926; it was rebuilt in 1932, but repeated the general plan of the Fr. T.

*The Eighteenth Century: Italy.*—In Italy throughout the eighteenth century there was considerable theatrical activity, and, abandoning the original Renaissance rectangular buildings, many new Ts. were built in semicircular and horseshoe form. The main experimentation was in the position of the proscenium arch. At first action was placed before it, the scenes being set behind, but early in the century all action was placed behind the arch, the platform stage being completely abolished. This form of stage was copied in France, whence a century later it was transported to England. There was practically no development in T. building anywhere throughout the nineteenth century, and the picture-frame stage was firmly established for spectacle and realism.

*The Twentieth Century.*—The most important influence in the twentieth-century T. was Gordon Craig's, whose ideas of staging were so inappropriate to the picture-frame T., however, that his ideas of production could not be reconciled with the requirements of the commercial T. Craig's ideas were the basis of the work of Max Reinhardt in Germany and Austria where in great spectacular shows such as *The Miracle*, and in performances at the Grosses Schauspielhaus in Berlin, he applied Craig's simplicity, immensity, and theatrical effectiveness. In France Jacques Copeau at the Théâtre du Vieux Colombar transformed the stage into a semi-permanent setting for plays.

In the U.S.A. the estab. of the T. was

slow, owing to Puritan opposition, but made headway in the nineteenth century, when much T. building was carried out; but the centre of the commercial T. remains in New York city, where it is a leading element in the city's entertainment industry. The Ts. were built on European designs and no developments took place. In the little Ts. that sprang up all over the country under amateur

Brit. T. has continued to be a private enterprise in London and throughout the country. Generally speaking the ownership and management of Ts. has been in other hands than those responsible for the production of plays, though there have been exceptions. The production of plays is mainly in the hands of commercial groups, who with their own money or the money of 'backers' provide the con-



A GEORGIAN THEATRE

*Architectural Review*

A view of the auditorium and stage, from the lower circle, of the Theatre Royal, Bristol (q v)

control a good deal of experimentation was done in modernising the stage and in the creating of intimate Ts., and a T. is now a normal part of Amer. univ. equipment. The Folger Shakespeare Library in Washington, the greatest Shakespearian collection in the world, is housed in a building constructed on the design of an Elizabethan playhouse, the detailed contract for the Fortune T. of 1600 being closely followed. Thus America has an example of a Shakespearian playhouse, but it is not used for performances. Stage design in America owes much to the work of Robert Edmund Jones and Norman Bel Geddes, and to-day the expressionist or constructivist setting is often seen in use.

**Production and Management.**—The original acting companies in the Elizabethan T. were self-governing, and Shakespeare's company, known as the King's, had its own Ts., the Globe and the Blackfriars. Other Elizabethan Ts. were built by business men such as Philip Henslowe, who for a period had Edward Alleyn the actor as partner, and by building speculators. At the Restoration the two London Ts. were built by the patentees who had official support from investors. The

siderable finance required. Some of these commercial groups, which operate in London and in most large cities, are on a permanent basis. There are exceptions to these commercial interests such as the Old Vic, some of the repertory companies, the Stratford-on-Avon Shakespeare Festival Company, and other companies formed with the object of sustaining theatrical art. The Arts Council is a gov.-appointed body with Treasury support (formed in 1940 as C.E.M.A.), one of whose objects is to support the T. as an art.

In France, Germany, and many other countries the T. has been under state or royal patronage, the T. being provided and the performances given as national or civic enterprises, but most Ts. are private enterprises. In Soviet Russia and other Communist controlled countries the T. is state controlled and used for propaganda and public education. In England public money is now being made available for the T.

The Brit. Gov. is to provide the sum of £1,000,000 for a National T. on a site provided by the London Co. Council, but economic conditions have not yet allowed the scheme to be carried out. Under the Local Government Act, 1948, local



authorities are empowered to build and manage Ts. At present the stage is organised to provide pictures in perspective or interior sets of a realistic kind. Stage management is a highly specialised occupation observing, largely, traditional methods. Some stages (e.g. Drury Lane) have mechanical devices enabling the floors to be raised or lowered in sections, and all stages provide for scenery, sometimes complete sets, to be 'flown.' The use of the space over the stage for raising or lowering properties or actors has existed since the Elizabethan T. with its 'heavens.' Movable floors (e.g. Stratford-on-Avon Memorial T.) enable settings to be transposed into the 'wings,' and revolving stages are often employed. Stagelighting is now sometimes operated by remote control from the auditorium.

**Acting.**—The essential art of the T. is acting, to which all other theatrical arts are subordinate. At all times acting has been conditioned by theatrical buildings as well as by the requirements of the drama, so that there have been considerable differences in acting from period to period and from country to country. The original Gk. actors were the dramatists who took the part of the protagonist, and the poet Thespis (535 B.C.) gave his name to the art of acting. When plays in the fifth century were first performed by professional actors they were always men. The most famous Rom. actor was Roscius (Gallus (d. c. 62 B.C.), excellent in tragedy and comedy, who wrote a work on acting. Women did not perform on the Rom. stage until the second century A.D., when spectacle and pantomime were the main dramatic fare. The Christian Church condemned actors, and in the fourth century excluded them from the sacraments, a prohibition that lasted for more than a thousand years. By the sixth century there was an end of acting in Europe. Its revival came through the teaching of the clergy both in Church and schools, and in the Middle Ages there were performances everywhere, by amateurs, of mystery, allegorical, and comic plays. Companies of actors existed in England from the fifteenth century onwards, attached to the households of great lords. In Italy in the sixteenth century arose the *Commedia dell'Arte*, one of the greatest schools of comedy acting. In the sixteenth century the Burbages estab. the actor's art as a permanent feature of London life. Thereafter there were many famous actors, the first being Richard Burbage and Edward Alleyn, and there is a tradition that Shakespeare was an actor. Continental acting was early adapted to the picture-frame stage, but Eng. acting did not fully accommodate itself to this form of staging until the nineteenth century. No school of acting exists in England comparable with the *Comédie Française*, which since the late seventeenth century has maintained a standard of classical acting in France. The feature of Eng. acting has always been its naturalism. At all times the activities of amateur actors have been considerable in England, and amateur

drama is now one of the most important cultural activities in the country, the number of amateur societies being reckoned to be 25,000. Some of these societies individually or through local federations have Ts. of their own.

**See also CENSORSHIP OF THE DRAMA; COMÉDIE FRANÇAISE; COMMEDIA DELL'ARTE; COSTUME DESIGN; THEATRICAL; DRAMA; MIRACLE PLAYS; NATIONAL THEATRE; REPERTORY THEATRE; THEATRES, LAWS RELATING TO.**

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**Théâtre Français, see COMÉDIE FRANÇAISE.**

**Theatre Royal.** In London Drury Lane Theatre (q.v.) and the Haymarket Theatre (q.v.) are permitted to use this title.

**Theatre Royal, Bristol,** oldest playhouse in England, opened in 1766. The plan owes much to the Drury Lane Theatre of 1674, but the auditorium is believed to be the first in England constructed in a horse-shoe shape. After its opening licensing difficulties were experienced until, in 1778 by a special Act of Parliament, letters patent were granted. Almost every actor of note since 1766, except David Garrick, has appeared on its boards. The theatre is now under the control of the Arts Council, and is the home of the Bristol Old Vic Company.

**Theatres, Laws Relating to.** By the Theatres Act, 1843, all theatres for the 'performance of stage-plays' must be licensed. Stage-play by section 23 includes 'every tragedy, comedy, farce, opera, burletta, interlude, melodrama, pantomime, or other entertainment of the stage.' The lord chamberlain is the licensing authority as to all theatres (except patent theatres, the only existing example of which is Covent Garden) within the parl. boundaries of London and Westminster, and in the bors. of Finsbury, Marylebone,

Tower Hamlets, Lambeth, Southwark, New Windsor, and Brighton. In co. bors. the licences are granted by the tn. councils, in non-co. bors. by the co. council, while the L.C.C. is the authority for those parts of London which are not within the jurisdiction of the lord chamberlain. A licence will be granted to the manager of the theatre only. (As to licensing of plays, see CENSORSHIP OF THE DRAMA.) *Keeping a 'theatre'* without a licence entails a penalty of £20 for every day; *representing* for hire a stage play in an unlicensed place, a daily penalty of £10; *performing* in public a new play without the leave of the censor, £50, and avoidance of the theatre licence. In regard to structural requirements for the prevention of fire, the L.C.C. has power under the London County Council (General Powers) Act, 1915, to revoke music and dancing licences if the terms or conditions on which they were granted are contravened, and under a similarly entitled Act of 1923, the council may vary the conditions attached to licences for stage plays granted by it under the provisions of the Disorderly Houses Act, 1751, the Cinematograph Act, 1909, or any amending Act. The enforcement of fire regulations is also provided for under the London County Council (General Powers) Act, 1923, and, in the metropolis, the council can close theatres for breach of the regulations. Provision is now made for compulsory registration of theatrical employers under the Theatrical Employers Registration Act, 1925, the object of which Act is to prevent persons of no substance from engaging companies and then abandoning them or failing to pay their salaries. All theatrical employers must hold a certificate of registration issued by the appropriate authority, which is the co. or bor. council or, for the metropolis, the common council. The Act does not apply to an employer or his agent having a licence under the Theatres Act, 1843, or a music and dancing licence; or to persons who employ for charitable performances, and not for gain or by way of business. By an amending Act of 1925 the registration authority can institute and prosecute proceedings against and oppose applications by persons whose certificates have been cancelled; and they can also refuse, cancel, or suspend the registration of a person who has been convicted of an offence involving dishonesty. Places licensed for music and dancing are exempt from the provisions of these two Acts. Restrictions are imposed by the Children and Young Persons Act, 1933 (re-enacting analogous provisions of the Education Act, 1921, and the Children (Employment Abroad) Act, 1913, respectively), on children taking part in entertainments, and on the taking of children or young persons out of the United Kingdom with a view to their singing, playing, performing, or being exhibited for profit. The proper course where it is proposed to put a child on the stage is to obtain the leave of a magistrate. In Scotland, where the fitness of a child for training is proved, the petty

sessional court will grant a licence allowing it to be trained for the stage, provided the court is satisfied that provision has been made to secure kind treatment. Dramatic and musical performances are protected by the Musical Performers' Protection Act, which prohibits unauthorised persons from making records (i.e. any mechanical contrivance for reproducing by sound) of any such performances; but it is a good defence to prove that the record was not made for purposes of trade. See also CENSORSHIP OF THE DRAMA; MUSIC AND DANCING LICENCES.

**Thēbaine** ( $C_{10}H_{21}NO_2$ ), one of the alkaloids contained in opium in combination with meconic acid. It is very poisonous, causing severe convulsions. It gives a blood-red coloration with concentrated sulphuric acid.

**Theban Legion, The**, legion of the Emperor Maximian Herculeus, which consisted of Christians recruited in Upper Egypt. Traditionally the entire legion was massacred in 287 when its members refused to take part in the pagan sacrifices prepared by Maximian at Agaunum, Switzerland, before engaging in battle. The names of some of the legionaries are known. A basilica was built at Agaunum (St-Maurice-en-Valais) in the fourth century to enshrine the martyrs' relics. Some authorities question whether the whole legion was massacred. The feast of the T. L. is celebrated on Sept. 22.

**Thebes:** (Gk. *Θῆβαι*, Heb. *No-Ammon*). 1. Name of an anc. city of Upper Egypt, which was then known as Thebais. It survives to-day in the splendid array of ruins at Karnak and Luxor. T. was founded probably under the 1st Dynasty, and sprang into prominence in the 12th Dynasty. The city consisted of two main portions, separated by the Nile, each part extending from the bank of the riv. to the base of the hills which envelop the valley of the Nile. Its site is now marked by the tn. of Luxor and the vil. of Karnak on the E. side and by Gourna and Medinet-Habu on the W. Its most flourishing period appears to have been between 1600 and 1100 B.C., when it was the cap. of all Egypt, and a prin. seat of the worship of Ammon. The Gks. learned of its fame as early as the time of Homer, who describes T. with enthusiasm. Its circumference was estimated by Diodorus Siculus to be about 17 m. It was the residence for sev. centuries of Egyptian kings, whose tombs have since been discovered. During the reigns of the Ptolemies T. was neglected and Memphis became the cap. In 525 B.C. T. was partly burned by the Persians under Cambyses, and in 86 B.C. it was captured and plundered by the Gks. The buildings and sculptures still extant are among the most anc. and the best specimens of Egyptian art and architecture. Discoveries by archaeologists suggest that T. was a much more important city than had previously been thought. See W. M. Flinders-Petrie, *Six Temples at Thebes*, 1896; J. Capart and M. de Werbrunck, *Thebes: la gloire d'un grand passé*, 1925; M. L.

Pillet, *Karnak and Louxor*, 1928; and H. E. Winlock, *Tomb of Queen Meryet-Amun at Thebes*, 1932. 2. Chief city of Boeotia in auct. Greece. Its position was well defended, since it was situated in the middle of a plain surrounded by mts. No city is more famous in the mythical ages of Greece than T. It was here that the



André Roos

#### THEBES, UPPER EGYPT

Temple reliefs at Medinet Habu of Rameses III (1198-1167 B.C.: XXth Dynasty) making offerings to Ammon

use of letters was introduced from Phœnicia; it was the traditional bp. of Dionysus and Hercules: it was the native city of Tiresias the soothsayer and of Amphion the musician. It was the scene of the tragic fate of Oedipus, and of the war of the 'Seven against Thebes.' Soon afterwards, the Argivei or descendants of the seven, marched against T. to avenge their fathers' death, captured the city, and destroyed it. The first historical trace of the city is found in the conquest by the Boeotians about the year 1100 B.C. T. then became the chief city of a confederation. Later the city fought Athens, and later supported Persia against her invaders. She became the closest ally of the Spartans, and during the Peloponnesian war was Athens' bitterest foe. At

the close of the war, however, she allied with Athens against Sparta, but the city was conquered and garrisoned by the Spartans. After the battle of Leuctra (371 B.C.) for a short time she became, under Epaminondas, the most powerful state in Greece; but with the death of Epaminondas at the battle of Mantinea, 362, T. lost her newly won supremacy. She was defeated and captured by the Macedonians, and utterly destroyed by Alexander the Great (335 or 336 B.C.). The tn. was restored about 315 B.C. Pop. 6800.

**Thecla, Saint**, Gk. saint of the Christian Church, who lived in the first century. The *Acts of Paul and Thecla*, which was written in the second century and is often untrustworthy, describes her as a member of a noble family in Iconium, in Lycæonia, who was converted by the preaching of St. Paul. She is said to have followed him, dressed in boy's clothes, and to have suffered many cruel tortures for her faith. The prayer for the dying in the Rom. ritual stresses 'three most cruel torments.' St. T. is said to have died in Seleucia. Though the story seems to have a factual basis, it appears to have become much embellished. Her feast-day is on Sept. 23.

**Theft**. In most communities, auct. and modern, the institution of private property has occasioned the formulation of copious laws for the redress of violations by T. of the exclusive rights of ownership. But in an age of ungoverned violence, when legislators or law-givers had not as yet attained to the conception of the preservation of public order for its own sake, the legal code of an auct. state reflected a very different view of the moral aspect of stealing from the modern view, or even from that of the earliest Christianised communities. Maine asserts with a great show of probability that the auct. Rom. and Gk. codes had no real law of crimes at all, and that such penal laws as they do reveal are no more than the law of wrongs or torts (see TORT). The first civil wrong recognised by the Twelve Tables was that of *furtum* (T.), and even assaults and violent robbery were no more than *delicta* (torts). All such wrongs gave rise to an *obligation* or *vinculum juris*, the fulfilment of which was considered complete with the payment of money. T. is defined in the *Institutes of Justinian* as 'the fraudulent dealing (*contractatio rei fraudulosa*) with a thing itself, or with its use, or its possession; an act which is prohibited by natural law.' This definition affords some striking points of resemblance to most modern definitions of stealing (cf. that of larceny in Eng. law, under LARCENY). Though, whether by reason of the influence of Christian ideas or the attainment of a more subtle analysis of motive, the text of the *Institutes* continues: 'A person, however, who borrows a thing and applies it to a purpose other than that for which it was lent, only commits theft if he knows he is acting against the wishes of the owner . . . for there is no theft without the intention to commit theft.' In England the doctrine of the King's Peace was the foundation of T. as a public wrong; on the Continent it is to be traced to the

source of *Naturrecht* or Natural Law (see JURISPRUDENCE and *JUS GENTIUM*). The A.-S. laws of Ina, Athelstan, and others respecting the punishment of T. reveal a curious compromise between the Draconian severity of a pagan state and the mildness inculcated by the Christian missions from Rome; death was nominally the punishment in cases of T. where the value of the article taken exceeded 12*d.*; but in practice the thief could always compound his offence by a fine. Up to comparatively recent times, however, felonious T. remained a cap. offence (see CAPITAL PUNISHMENT). At the present time T. connotes a variety of cognate but distinct offences, varying from larceny (*q.v.*) to fraudulent breach of trust. See also BURGLARY; EMBEZZLEMENT; FRAUD; LARCENY.

**Thegn**, see THANE.

**Theine**, see CAFFEINE.

**Theism**, see DEISM.

**Theiss** (Hungarian Tisza), central European riv., which flows through the Ukraine, Hungary, and Yugoslavia. It rises in two head-streams on the slopes of the Carpathians, where it is known as the White T. and the Black T. It takes a winding course, generally in a W. or S.W. direction, to empty its waters into the Danube near Titel, after receiving the Szamos, Maros, Körös, Sajó, and Latorcza. Length 820 m.

**Thellusson, Peter** (1737-97), Brit. merchant, b. in Paris, son of the envoy of Geneva; he settled in London and became naturalised. He amassed a great fortune and his son, Peter Isaac, was created Baron Rendlesham (1806). His name is remembered for his eccentric will, the harsh provisions of which led to the passing of what is known as the Thellusson Act (1800). By his will T. directed the income of his property to be accumulated during the lives of all his children, grand- and great-grandchildren, who were living at the time of his death, for the benefit of some future descendants to be living at the decease of the survivor, thus keeping within the letter of the rule of perpetuities which allowed any number of existing lives to be taken as the period for an executory interest (see EXECUTORY). For the provisions of the Thellusson Act, see under ACCUMULATION. See also PERPETUITY.

**Theme**, in music, prin. melodic feature in a composition, differing from a subject by greater length and more self-contained completeness, a subject being usually susceptible to development, *e.g.* in a fugue or sonata-form work, whereas a T. may be said more often to undergo restatement or decorative elaboration, especially in varied form. Sets of variations are always based on a T.

**Themis**, in Gk. mythology, daughter of Uranus and Gea, and by Zeus the mother of Eunomia, Dike, and Eirene. She was the personification of law and order and presided over the oracle at Delphi before Apollo.

**Themistius** (c. A.D. 320-90), oriental philosopher and rhetorician, was a native of Paphlagonia. He settled in Constanti-

nople about 347, where he became a senator (355) and prefect (384). He wrote paraphrases of various works of Aristotle. The *editio princeps* is that of Aldus (Venice, 1534). See eds. of G. Dindorf, 1832, L. Spengel, 1866, and E. Baret's *De Themistio Sophista*, 1853.

**Themistocles** (c. 524-459 B.C.), Athenian soldier and statesman. He was always ambitious, and began his career by setting himself in opposition to those who had most power, and especially to Aristides, to whose ostracism (483) he contributed. From this time he was the political leader in Athens. T. advocated naval expenditure to protect Athens from Persian invasion, and through his influence 100 new triremes were constructed and the port moved from Phaleron to Piræus. During 493-492, the years of his archonship, T. was supreme, and for the next ten years exercised almost unlimited power. It was T. who forced the naval engagement at Artemisium to take place. Seeing that the commander Eurýbiades was wavering and unwilling to fight, T. sent a message to Xerxes that unless he attacked at once the Gks. would make good their escape. The Persians, accordingly, blocked the W. exit of the bay with 200 ships, so that a battle was inevitable, and the glory of the battle of Salamis in which the greater part of the fleet of Xerxes was destroyed (483) fell to T. On the retirement of the Persians, he rebuilt the walls of Athens and strengthened the fortress and harbour of Piræus. He also removed the *μετοίκιον*, an alien's tax, and thus encouraged many foreign traders to settle in Athens. He appears to have gradually lost his influence with the Athenians soon after the Persian defeat, probably on account of his arrogant manners, and about 471 was accused of peculation (possibly justly), ostracised, and banished from Athens. He retired to Argos, and when accused of treason fled to Coreyra, and finally was welcomed by Artaxerxes. He settled in Magnesia, where he lived till his death. See lives by Plutarch and Cornelius Nepos, monograph by A. Bauer, 1881, and G. Grote, *History of Greece*, 1846.

**Theobald** (d. 1161 or 1162), Eng. prelate, studied law under Lanfranc at the abbey of Bec, Normandy. In 1138 he was nominated archbishop of Canterbury by Stephen. It was probably at his instigation that the pope refused to give his permission to T. to crown Stephen's son Eustace as king of England (1152). He was one of a select body of experienced Eng. advisers who were appointed by Henry II. soon after his coronation as justiciars.

**Theobald, Visconti**, see GREGORY (popes), Gregory X.

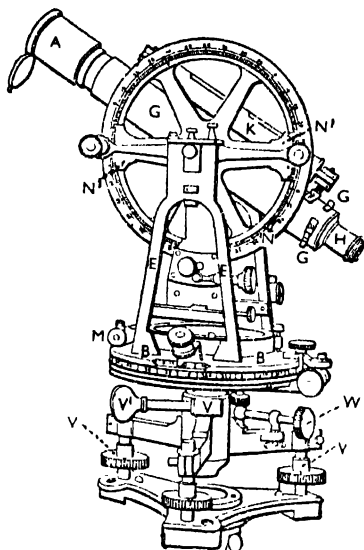
**Theobalds Park**, dist. in Hertfordshire, England, near Waltham Cross, 12 m. from London. Here Lord Burghley built a house which subsequently became the property of James I. who died there. It was pulled down about 1765 and another house was built. In 1888 the old Temple Bar of Fleet Street was re-erected here at one of the park entrances. In 1931 the house, which had been the property of the Meux family, was opened as a country club.

**Theocracy** (Gk. *θεοκρατία*, government by God), a term applied to the constitution of the Israelitish government as established by Moses, on account of its being under the direct control of Jehovah. This constitution underwent modification with the election of Saul as king, and with the subsequent choice of David, the king 'after God's own heart.' Israel became a theocratic monarchy: the king was considered as mediator between God and his people (II Sam. xxiv. 17). In the books of the Maccabees the concept of God's personal gov. is less apparent (see, however, I. Macc. iv. 20).

**Theocritus**, bucolic poet, was a native of Syracuse, and the son of Praxagoras and Philinna. He visited Alexandria during the latter end of the reign of Ptolemy Soter, where he received the instruction of Philotas and Asclepiades. His first poems, in 285 B.C., obtained for him the patronage of Ptolemy Philadelphus, in whose praise he wrote the 14th, 15th, and 17th Idylls. T. was the creator of bucolic poetry as a branch of Gk., and, through imitators such as Virgil, of Rom. literature. The bucolic idylls of T., 30 of which are extant, are of a dramatic and mimetic character, and are pictures of the ordinary life of the common people of Sicily. He also wrote epic poems. See J. A. Symonds, *The Greek Poets*, 1873; W. S. Landor, *Criticisms on Theocritus*, 1876, and P. E. Legrand, *Étude sur Theocritus*, 1898.

**Theodicy** (θεος δικη), etymologically the justice of God. The present use of the term is due to Leibnitz who pub. in 1710 his *Essai de Theodicee sur la Conté de Dieu, la liberté de l'homme et l'origine du mal*, a defence of the justice of God and investigation of the problem of evil. T. is really a sub-division of Natural Theology (q.v.) as it follows logically from the treatise on the existence and nature of God.

**Theodolite**, most important of the instruments used in surveying, by which the measurement of angles, vertical, but especially horizontal, is performed. It consists of a telescope mounted so as to move on two graduated circles, one of which is horizontal, and the other vertical. The axes of the telescope pass through the centres of these two circles. The instrument is carefully adjusted on a pedestal which when in use stands upon a tripod stand. An elaborate arrangement of screws and plates enables the T. to be adjusted with great precision. Though the T. can measure both vertical and horizontal angles, the latter only can be measured with perfect accuracy. For the measurement of vertical angles a levelling instrument is more accurate. There are three main types of T.—the Everest, the Y-pattern, and the transit—but the differences between them do not essentially affect the construction. It is important to notice a change that has been made in graduating Ts. Until recently, Brit. Ts. were divided into degrees, of which 360 made the complete circle, but they are now frequently made with the Fr. centesimal graduation in which the circle is divided into 400 divs.



THEODOLITE.

The illustration shows one form of Theodolite resting on its levelling screws on a tripod.

A, object-glass and cap, B, upper plate or limb, C, supporting limbs of telescope, etc., D, body of telescope, and diaphragm; E, eyepiece; F, spirit-level on telescope; G, microscope for vernier, H, I, leveling-screws, J and K, slow-motion clamping-screw.

**Theodora** (c. A.D. 508–548), wife of the Byzantine emperor Justinian, notorious before her marriage as an actress and dancer of ill-repute, was proclaimed empress in 527. She showed high courage in the Nika insurrection (532), and was an able counsellor in all matters of State. She succeeded the poor, especially those of her own sex, and died at an early age, exhausted by the cares of State. Her character suffered no taint after her marriage, and indeed posterity might have known nothing derogatory to her but for the *Secret History* of Procopius, whose other writings extolled Justinian and his Empress. There is no hint of her profligacy in other writers. See A. Debidur, *L'impératrice Theodora: Étude critique*, 1885, which is a refutation of Procopius. T. is the subject of a play by Sardou, produced in Paris, 1884. See W. G. Holmes, *The Age of Justinian and Theodora*, 1912.

**Theodore von Neuhoff**, see NEUHOFF, THEODOR VON.

**Theodore of Abyssinia**, see ABYSSINIA.

**Theodore of Tarsus** (St. Theodore) (c. 602–690), saint and archbishop, b. at Tarsus, Cilicia. He spent some time at Athens and became a monk at Rome. At the age of sixty-six he was appointed by Pope St. Vitalian to the see of Canterbury at

the suggestion of the African St. Adrian, who accompanied him to Eng., and acted as his adviser. T. has been rightly called the second founder of the see of Canterbury and the first primate of the Eng. church. He travelled extensively over the country, promoted learning, opened schools, consolidated or re-established dioceses, and held the first national council in 673 at Hertford. His activities involved him in disputes with St. Chad and St. Wilfrid on questions of jurisdiction, but these controversies were amicably settled. St. T. has a strong claim to be considered as a prominent figure in Eng. hist. See lives by O. Fritzsche (1847), H. B. Swete (1880-82), A. Mai (1832, 1854), and E. Sachau (1869). See also L. Patterson, *Theodore of Mopsuestia and Modern Thought*, 1926.

**Theodoretus or Theodoret** (c. 393-457), Syrian bishop and theologian. Trained by Theodore of Mopsuestia and St. John Chrysostom, he became a deacon in the church at Antioch and in 423 bishop of Cyrus. His efforts against the Marcionites were so successful that he claimed to have baptised 10,000 of these heretics. Having protested against the condemnation of Nestorius (see NESTORIANS) by the council of Ephesus (431) T. was deposed and compelled to retire to a monastery (449). But at the council of Chalcedon (451) he made his submission and was reinstated in his bishopric. T. was the author of a *History of the Church from 329 to 429*, *Φαλόεος Ἱστορία*; *Eranistes*, a dialogue against Eutychianism, *Ten Orations against the Heathen*, an *Apology for Christianity*; *A Concise History of Heresies*; besides 146 letters and commentaries on the O.T. and on the epistles of St. Paul.

**Theodoric (or Théodéric) I.**, king of the Visigoths (A.D. 418-51), and son of Alaric. He succeeded Wallia, and warred against the Romans from 425-40, defeating them at Toulouse (439), soon afterwards concluding peace with them. Then, uniting with Aëtius, the Rom. general, against Attila the Hun (450), he fell in battle at Châlons-sur-Marne. **Theodoric II.**, his second son, became king of the Visigoths (452-66), after murdering the elder, Thorismund, and ruled over most of Spain and Gaul. He was assassinated by his brother Euric.

**Theodoric the Great** (A.D. 455-526), founder of the Ostrogothic monarchy in Italy, b. in Pannonia. As a child he was a hostage at Constantinople, and soon after his return to his father, Theudemir, attacked the king of the Sarmatians and captured Singidunum (Belgrade). Theudemir and his son now successfully invaded Mœsia and Macedonia, and on Theudemir's death (c. 474), T., after some raids against the emperor Zeno and a rival Gothic chieftain, set out to win Italy from Odoacer, whom he defeated at Verona. The conquest was delayed by treachery, and Ravenna, whither Odoacer had fled, was besieged. After its capitulation, T. violated the terms by slaying Odoacer (493). T.'s thirty-three years' reign was a period of peace and prosperity for Italy such as it had

not known for centuries. He maintained his traditional Arian creed, but was impartial in religious matters. His closing years were sullied with the judicial murders of Symmachus and Boethius. He figures in the Nibelungenlied, being known to the Gers. as Dietrich von Bern (Verona). See T. Hodgkin, *Theodoric the Goth*, 1891, 1923; E. Caspar, *Theodoric und das Papsttum*, 1931; M. Brion, *Théodéric. Roi des Ostrogoths*, 1936; G. Vetter, *Die Ostgoten und Theodoric*, 1938.

**Theodosia**, see FRODOSIA.

**Theodosius**, Rom. general of the reign of Valentinian I. He fought against the barbarians of Britain and Germany (367), and crushed a Moorish insurrection in Africa (373). The reason of his execution at Carthage (376) is unknown. His son was the emperor Theodosius the Great.

**Theodosius I., Flavius, the Great** (c. 346-395), E. Rom. emperor, b. in Spain, son of Theodosius, the general of Valentinian I. He became emperor in 378 at the invitation of Gratian. T. warred successfully against the Goths, and by skilful diplomacy enlisted 40,000 of them as his allies (382). In 388 he defeated the usurper Maximus at Aquileia, and secured the W. throne for Valentinian II, brother of Gratian. After Valentinian's death (392) T. marched against another usurper, Eugenius, whom he defeated near the Frigidus (394), and became sole emperor. After a few months, however, he d. at Milan, and the empire was divided between his two sons, Honorius and Arcadius, the former ruling the W., the latter the E. T. was responsible in 390 for the famous massacre of the governor by the circus-mob. He did his utmost to countermand the order, but his messengers were too late; and St. Ambrose compelled him to do public penance before admitting him to the cathedral at Milan. See V. E. Ffichier, *Histoire de Théodose le Grand*, 1679; T. Hodgkin, *Dynasty of Theodosius*, 1889; E. Stein, *Geschichte des spätromischen Reiches* (vol. I.), 1928.

**Theodosius II.** (401-50), grandson of T. the Great, and son of Arcadius, succeeding him as emperor of the E. (408). His sister, Pulcheria and his empress, Eudocia, and the pretorian prefect, Anthemius, ruled during his minority. Wars with the Persians (421-41) and the Huns under Attila (441-48) were among the chief events of his reign. *The Codex Constitutionum* in 16 books, was pub. in 438. See F. D. Gorlach, *De Theodosio Junior*, 1751; A. Gildenpennig, *Geschichte des oströmischen Reiches unter Arcadius und Theodosius II.*, 1885; T. Mommsen and P. M. Meyer, *Theodosian Libri XVI.*, 1904-05; E. Stein, *Geschichte des spätromischen Reiches*, vol. 2, 1928.

**Theognis of Megara** (b. c. 540 B.C.), Gk. elegiac and gnomic poet, was by birth a noble. He was deprived of all his property and shared the exile of the oligarchical party. The greater part of his poems were composed during his period of exile. He is the best preserved of the G. elegists, and owes his fame chiefly to his 'maxims.' There is an ed. of his works by H. Williams, 1910.

**Theogony** (Gk. *θεός*, god; *γονός*, seed), genealogy of the gods. Many early Gk. poets wrote verse theogonies, of which only one, that of Hesiod, is extant.

**Theology** (Gk. *θεός*, god; *λογία*, science), science of religion, dealing therefore with God, and man in his relations to God. The term may be still further restricted to mean systematic T., in which dep. it deals with the specific doctrines, principles, and characteristics of Christianity alone. T. is treated under two main heads, Natural and Revealed T., and until the last century it was usual to keep the two subjects strictly apart. Various causes, chief of which is the application of the theory of evolution to religion and T., have led to the rise of a Broad or Modernist school of thought. This seeks to do away with hard and fast divisions, and in T., as elsewhere, strives to minimise the importance or deny the existence of critical points in the world's hist., and to trace instead an orderly development. It is evident that without an entire break with historic Christianity, no such change can take place with regard to dogmatic T., and modernist T. has not shrunk from a somewhat drastic restatement.

There is a very close affinity between T. and philosophy. While philosophy seeks the ultimate reality underlying phenomena, T. seeks the knowledge of God in Himself, and in the light of that knowledge the creature's relation to Him. It may at first appear so much a question of faith that investigation of it along the lines of reason must be beset with difficulty. But while philosophers claim that religion is in no way opposed to reason and that the study of faith as a human experience lies within the limits of legitimate knowledge, theologians apply themselves to the doctrinal content of such faith. According to Hegel, a leader of the rational school, religious knowledge is composed of doctrines based first upon the dictates of reason through actual experience, and then by deduction after examination of such experience.

In contrast to all this, Catholic T. of all ages takes its stand upon a divine revelation from without the human mind. Rationalists are also attacked by the philosophers who form the empirical school, not in protest against their attempt to compass understanding of God with human understanding, but rather because they allow the possibility of other systems of deistic beings. Both Locke and Butler are of this school. They base their T. upon human experience as the source of revelation of God's will, and they deny the possibility of there being any soul other than God's, of which the human soul is a part. The dogmatists, who form what may be termed the parent body of theologians, accept without question the fact of God's existence. Every act of man which leads him towards God is regarded not as upon man's initiative, but upon God's. And God by such acts of man is expressing this Divine Will in a progressive process of revelation to him. Dogmatists are therefore metaphysical,

and this is particularly noticeable in their presentation of the theory of Christ and His Incarnation. Many hold that Christ's divinity is certain: the Alexandrian School did so from a Platonic standpoint. The Antiochene School, however, while professing Christ's divinity, sought to discard the allegorical interpretation of the scriptures, and approached the subject from an empirical direction. Of the two schools, that of Alexandria has proved the more popular throughout hist. The question of Christ's divinity and His identification in the Trinity is the subject of discussion even to-day outside the Rom. Catholic and Orthodox Churches. Unitarians disregard His divinity, indeed, deny it, seeking thus to dispose of the difficulty, but among early Trinitarians were differences of opinion as to whether Christ is God in another manifestation, or a part of Him as a divine emissary.

The study of T. begins with exegesis, the submission of the Scriptures to the Lower and Higher Criticism, and from this follows *historical T.*, the study of Christian doctrine as it has manifested itself in the hist. of the Church from the formative or Patristic period to the present day. The study of the nature of God (as distinct from doctrine) is known as *systematic T.*, and the philosophy of religion, with which Natural T. (*q.v.*) is now identified, concerns itself with this branch of study. It includes the study of the idea of God, the freedom of God, and the operation of Grace, and finally the nature of immortality, which is the subject, as a separate study, of eschatology (*q.v.*). The philosophy of religion, which embraces comparative religion and the psychology of religion came into being in its modern scientific forms only since the Renaissance. It divided into two main streams—the traditional, founded on revelation as it exists in the Scriptures, and the empirical, which, while also recognising the scriptures as the source of doctrine, argues the existence of God from the nature of man. In the nineteenth century mainly through the influence of Hegel and in the work of Schleiermacher (*q.v.*) and Otto, this more subjective view of T. held sway. In more recent times there has been a marked swing away from the importance attached to the religious experience of man and a return to the importance of revelation in the Word of God. This movement is associated particularly with the work of Karl Barth and Emil Brunner, and was clearly seen in the Occumenical Council of Churches at Amsterdam in 1948. See also BIBLE; FAITH; RELIGION. See H. R. Mackintosh, *Types of Modern Theology*, 1937; W. E. Kirk (ed.) *The Study of Theology*, 1939; C. Van Til, *New Modernism*, 1946; E. Brunner, *Christianity and Civilization*, 1947; W. R. Matthews, *God in Christian Thought and Experience* (7th ed.) 1947; A. Vidler, *The Theology of F. D. Maurice*, 1949; and C. Dawson, *Religion and Culture*, 1949.

**Theophrastus** (c. 372-287 B.C.), Gk. philosopher and naturalist, b. at Eresos in Lesbos. He was the pupil of Plato and

Aristotle in Athens, and on the death of the latter became head of the Peripatetic school, which drew large numbers of pupils from all parts. He was a close follower of the Aristotelian philosophy, giving his attention especially to natural history (e.g., fire, winds, and weather signs), and to botany. His chief works include treatises on politics, legislators, laws, metaphysics, the senses and imagination, oratory, poetry, and plants. His *Ethical Characters* are depictions of moral types, and were the model for later character writers. He is the reputed author of over 220 works, and, as the successor of Aristotle, was for long a supreme authority; but his writings are in great part lost. Eng. trans. by R. C. Jebb was pub. in 1870. The Oxford Classical Text of the *Characters*, ed. by H. Diels, was pub. in 1910. The text and trans. (by Sir A. F. Hort) of *The Enquiry into Plants* is in the Loeb Library. See J. M. Bochenski, *La logique de Théophrastus*, 1947.

**Theorbo**, obsolete instrument of the lute type, actually a kind of bass lute of large size with a double neck on which only the upper strings are stretched over a finger-board, the bass strings being at the side of it and not capable of producing different notes, except by retuning.

**Theorem** (Gk. *θεώρημα*, something to be looked at or seen), in mathematics, any proposition which states its conclusion, or makes some affirmation or negation requiring proof, whereas a problem states something which is to be done.

**Theory**, properly speaking, the mode of making seen and known the dependence of truths upon one another, or a supposition explaining something, especially one based on principles independent of phenomena to be explained. T. is popularly opposed on the one hand to fact and on the other to practice—the opposition is not essentially valid, and arises from the imperfection of Ts which cannot be reconciled with the data of experience certain or assumed. The distinction between theoretical and practical labourers in the field of science or art is not strictly a just one, for there is no theorist whose knowledge is based wholly on T., and there is no practical man whose skill is all derived from experience.

**Theosophy** (Gk. *θεός* god, *σοφία* wisdom) dates from a very high antiquity, coming down to us from the Neoplatonists, Plotinus, Iamblichus, and Proclus. It may be defined as a syncretistic attempt at a higher knowledge or more immediate approach to God than is offered to the ordinary believer by revealed religion, or by reason.

It is based on intuition. Numbered among theosophists also are Paracelsus, Boehme, and the Rosicrucians. In the E. also T. is of very ant. origin, the Sanskrit equivalent being *Brahma-Vidyā*, or divine knowledge. It is closely allied to mysticism, and involves a belief in one absolute, incomprehensible, and supreme deity who is the root of all nature, and

of all that is visible and invisible, a belief in man's eternal nature, which, being a radiation of the universal soul, is of an identical essence with it, and a belief that by returning to the purity of nature one can gain certain occult powers. Helena Petrovna Blavatsky (q.v.) (1831–91), a Russian princess, who it is claimed was initiated in Tibet, is the recognised founder of the two great branches of to-day. T. is supposed to be preserved by initiates scattered over the world who have attained spiritual perfection, but elect to watch over religion which they hope to unify under one system of ethics. A group of these Arhats, Mahātmās, or Masters, it is said, led Helena Blavatsky to found the Theosophical Society in 1875. Its teachings in general may be said to be founded on the two great principles of 'Karm'—which in Christian terminology would mean 'Whatsoever a man sows that shall he also reap'—and Reincarnation (q.v.), or the belief that man must undergo a series of lives until he has assimilated all the soul experiences and can attain to Nirvāna (q.v.). The terminology and the thoughts seem to the Westerner to be Buddhistic, but it is claimed that T. is not Buddhism (q.v.). After Helena Blavatsky died, W. G. Judge, of America, became the leader, and upon his death the society split into two sections, one following Mrs. Katherine Tingley, and the other Mrs. Annie Besant. See Helena Blavatsky, *Isis Unveiled*, 1877, *The Secret Doctrine*, 1888, and *The Key to Theosophy*, 1889; Annie Besant, *Theosophy and the New Psychology*, 1904. See also KRISHNAMURTI.

The secret powers claimed by Mme. Blavatsky were rejected by the London Society for Psychical Research. See E. Garrett, *Isis very much unveiled*, 1884, and F. Podmore, *Studies in Psychical Research*, 1895.

**Theotocopuli, Domenico**, called **El Greco** (c. 1545–1614), Greco-Spanish painter, b. at Phodele, near Candia, Crete. He studied in Venice under Titian. He was in Rome 1570–c. 1576, when he migrated to Toledo. In that city, where he lived the rest of his life, he painted for the cathedral the picture 'El Espolio' (the Stripping of Christ) (1579). His masterpiece, 'The Burial of Count Orgaz,' was painted, probably in 1587, for the church of S. Tomé, Toledo. T. was also an architect and sculptor. His stormy and mystical paintings, especially his religious works, with their foreshortened or strangely elongated figures, vehemently express his spiritual intentions. He reduced his palette to five colours, yet believed that colour was more important than design and used those few pigments to intense dramatic effect. Many of his portrait works are in the Prado, Madrid. He is represented in the National Gallery, London, by two early works and a much-restored replica of his 'Christ on the Mount of Olives.' There are better examples of his art in America. See Manuel B. Cossio's various works on T., especially *El Greco*, 1908, and studies by A. F. Calvert and C. G. Hartley, 1909;



A. Meyer, 1911; M. Barrès, 1911 and 1912; H. Kehrer, 1914; Elizabeth du Gue Trapier, 1925; F. Rutter, 1930; M. Legendre and A. Hartmann, 1937; L. Goldschneider, 1938. See also SPANISH ART.

**Thera, Thira, or Santorin**, Gk. is. in the Aegean Sea, the most southerly of the Sporades group, and lying about 60 m. N. of Crete. Its steep shores vary in height from 500 to 1200 ft. The entire N. half is composed of volcanic material, and from the earliest times the is. has been a centre of volcanic agency. The coastline is some 30 m. long, and opposite the inner or W. curve lies the smaller is. of Therasia. Both T. and Therasia have yielded interesting archaeological discoveries in the form of prehistoric dwellings, with antique vases and carefully worked stone instruments. According to Herodotus, Cadmus estab. a Phœnician colony in T. The tns. of the is. are built along the edge of the cliffs, which are striking for their black lava tufa and other volcanic strata, much of which is deep red in colour. The largest tn. is Thera (pronounced Phera), the houses of which have their foundations in the tufa. The is. produces some cereals such as barley, as well as figs, dried grapes, etc.

**Therapeutics, Therapeusis, or Therapy**, that branch of the science of medicine which deals with the cure of disease, the relief of certain symptoms, or the prevention of their occurrence, by various agencies. Remedial agencies are divided into classes, according to general similarity of treatment, e.g. arotherapeutics (q.v.), balneotherapeutics (q.v.), occupational electro-therapeutics, occupational therapy (q.v.), psychic therapeutics or hypnosis, physiotherapy (q.v.), serum therapeutics (q.v.), vaccine therapeutics (q.v.), hydrotherapeutics or hydropathy (q.v.), thermotherapeutics (by the use of drugs), etc.

**Therapnae**, tn. in Laconia, on the Eurotas, near Sparta, celebrated in Gk. mythology as the bp. of Castor and Pollux. Menelaus and Helen were said to be buried here.

**Theresa, St.**, see TERESA.

**Therezina**, see TERESINA.

**Therm**, statutory unit of heat, on the basis of which coal-gas is bought and sold. It is equal to 100,000 Brit. Thermal Units (B.Th.U.), and the latter unit is defined as the amount of heat required to raise 1 lb. of water through 1° F. (from 60° to 61° F.), and equals 251.9 calories (q.v.).

**Thermæ**, huge buildings which were erected by the Rom. emperors, which comprised not only baths of various kinds, but often also libraries, gymnasia, theatres, etc. The apartment provided for undressing was the *apodyterium*; the *alipterium* or *unctuarium* was a room for anointing, etc.; in the *frigidarium* was a cold bath, and in the *calidarium* warm baths. The *tepidarium* was a warm room, with no bath, in which the bather usually spent some time before undressing. T. were built by Agrippa (21 B.C.) and by the emperors Nero (A.D. 65), Titus (81), Domitian (95), etc.

**Thermal Unit**, see CALORIE; ELECTRICITY; HEAT.

**Thermidor** (from Gk. θερμη heat, and δωρον gift), month in the Fr. Republican calendar, introduced at the time of the Revolution. It extended from July 19 to Aug. 18, and became the eleventh month in the new calendar.

**Thermionics and Thermionic Valve**. T. is the branch of science that deals with the emission of electrons from matter under the influence of heat. Following the discovery of the electron by J. J. Thomson in the closing years of the nineteenth century, O. W. Richardson discovered the law connecting the emission of electrons from a body with its temp. This emission is really an evaporation of electrons from the body, and the rate of the evaporation is a function of the temp. of the body; the higher the temp. the greater the rate of evaporation. The evaporation depends on the nature of the surrounding gas, but Richardson found that in a highly evacuated atmosphere the formula  $n = A\sqrt{T} \cdot e^{-b/T}$  is a fairly accurate representation of the phenomenon:  $n$  is the number of electrons emitted per sq. cm. of the surface of the body per sec.,  $T$  its absolute temp.,  $b$  a constant, and  $A$  a constant, typical of the body. Further investigation by Langmuir led to the discovery that the evaporated electrons form a 'cloud' surrounding the heated body, and that ultimately equilibrium is estab. between the rate of evaporation and the rate of condensation, i.e. the return of the electrons under the electrical repulsion of the electron cloud or 'space-charge'.

The application of the results of Richardson's and Langmuir's researches led to the discovery and subsequent development of modern wireless technique, which depends for its success on the thermionic valve. (See further under VALVES.)

**Thermit, or Thermit**, mixture of finely powdered aluminium and oxide of iron ('hammer scale,'  $\text{Fe}_2\text{O}_3$ ), the heat of combustion of which produces a temp. of about 2600° C. It was invented by Vauten of London and utilised for welding by H. Goldschmidt of Essen. (See under WELDING). T. is used in incendiary bombs.

**Thermochemistry**, science founded on the law of the conservation of energy, which deals with the thermal effects accompanying chemical actions. Reactions in which heat is evolved are called 'exothermic,' and where heat is absorbed they are termed 'endothermic.' Measurements of the heat of formation of substances, the heat of solution, of combustion, and of the neutralisation of acids and bases, have been determined; also the heat of hydration, the heat of combustion, the heat of ionisation, the heat of dilution, etc. The heat of formation of a compound is measured by the number of units of heat expended during the formation of one gram molecular weight of it from its element. Heat of decomposition is the same as heat of formation, but with the sign reversed.

The amount of heat liberated in chemical reaction is determined by allowing it to warm a known quantity of liquid (generally water) whose specific heat is known, and measuring the rise of temp. by means of an accurate thermometer. The water calorimeter generally employed for this purpose consists of an inner platinum vessel surrounded by water contained in an outer vessel of silver, which is protected by poorly conducting material so as to diminish the loss of heat by radiation. The reacting substances, either in the pure state or in solution, are brought to the same temperature and introduced into the inner vessel. The temp. of the water is taken before and after the reaction, and from the rise of temp., the quantity of water present, and its specific heat (and knowing the water equivalent of the calorimeter) the amount of heat liberated is determined. In order that a reaction may be studied thermochemically it must take place at ordinary temps. and must proceed rapidly to the end. Many reactions which do not fulfill these conditions, such as many processes of combustion, can be made to fulfil them. This is done by causing the substance to be burnt, in the presence of oxygen under increased pressure, in a steel bomb lined with platinum or enamel. Only in a comparatively few cases has it been possible to make direct determinations of the heat value of chemical changes. Thermal values which cannot be determined directly can be calculated indirectly by methods depending on the fundamental principle of thermochemistry which was propounded by Hess (1840). This principle, known as the 'constancy of the heat sum,' may be stated thus: 'The heat evolved in a chemical process is the same whether it takes place in one or in several stages.' The heat change, therefore, is dependent only on the initial and final stages of the reaction or system of reaction. Thus the heat of formation of methane cannot be determined directly, but a value may be arrived at by subtracting the heat evolved when methane is burnt from that evolved when the corresponding weights of free carbon and hydrogen are burnt. The unit of heat used in thermochemical measurements is the caloric, or the quantity of heat which is required to raise the temp. of 1 gram of water from 0° to 1° C. The results of measurements are expressed by symbols, which mean gram-atomic, or, in the case of compounds, gram-molecular weights of the substances which react. Thus  $\text{H}_2 + \text{O} = \text{H}_2\text{O} + 68360$  calories means that 68,360 calories of heat are liberated when 2 grams of hydrogen and 16 grams of oxygen unite at ordinary temp. to form 18 grams of water. If the reacting substances are in solution, the presence of a large quantity of water is denoted by the symbol 'aq'—thus:  $\text{KOHaq} + \text{HClaq} = \text{KClaq} + 13,700$  calories. Other units of heat used are 100 gram-calories (K) and 1000 gram-calories (Cal.). As well as being of theoretical importance, T. has been found of great value in determining the heating power of fuels for com-

mercial purposes and calorific values of foodstuffs.

**Thermodynamics.** At the beginning of the nineteenth century the caloric theory of heat was accepted by scientists generally. According to this theory, heat is a fluid called the caloric that occupies the interstices between the particles of a body. The sum total of the caloric in the universe is constant, and it can neither be created nor destroyed. When a body is heated in a flame, caloric passes from the flame into the body, and the exchange increases the temperature of the body and decreases that of the flame. As the weight of a body does not increase when it is heated without chemical changes taking place, it was evident that the caloric was a weightless fluid. In order to explain the fact that different substances have different specific heats (*q.c.*), it was supposed that they possessed different affinities for the heat fluid. A change of state such as from ice to water without an accompanying rise of temp. was accounted for on the supposition that there was more room between the particles of water for the caloric, and that a given weight of water therefore contained more caloric than an equal weight of ice. The theory had its uses, and it is interesting to note that the theory of the caloric is implicitly used to-day in the earliest stages of instruction in physics. Two semi-quantitative experiments troubled the supporters of the caloric theory at the end of the eighteenth century. The first was performed by Rumford (*q.c.*) in 1798. A quantity of water was placed in a crude calorimeter of gun-metal, and a blunt steel borer pressing on its base was caused to rotate rapidly by means of horse power: eventually the water boiled, and Rumford demanded to know where the caloric had come from. The calorists gave the unsatisfactory explanation that a small quantity of the gun-metal had been broken up by the borer into fine powder and the caloric had escaped into the water. In the following year Davy (*q.c.*) caused two pieces of ice to be placed in the exhausted receiver of an air-pump arranged so that one piece of ice was fixed while the other was driven to and fro over its surface by means of a clockwork arrangement. Liquefaction was found to take place, and Davy confronted the calorists with the same serious problem of explaining the source of the caloric required to change the ice into water. Rumford and, to a lesser degree, Davy were convinced that the caloric theory had broken down and that 'heat is motion.' Nevertheless the caloric theory held its ground until the researches of Mayer and Joule definitely estab. its falsity in 1849.

**The First Law of Thermodynamics.**—Joule's experiment was essentially as follows. A special calorimeter was fitted with fixed lateral vanes between which other vanes attached to a vertical spindle could rotate. Round a pulley mounted on this spindle a double cord was wound, to pass from there over two pulleys to lead weights hanging freely. The weights descended, and the water inside the calori-

meter was churned, and was thereby heated. By a series of careful measurements Joule discovered that the amount of heat produced was always directly proportional to the mechanical work done in rotating the spindle. Furthermore, the constant of proportionality was always the same. The quantitative result of his experiments was that 772 foot-pounds of work expended produce 1 Brit. Thermal Unit of heat (*i.e.* the quantity required to raise the temperature of 1 lb. of water 1° F.). Joule's quantitative researches confirmed Mayer's qualitative speculations that heat is a form of Energy. In 1847 Helmholtz read a paper to the Physical Society of Berlin, *Ueber die Erhaltung der Kraft* (On the Conservation of Force) and he is regarded as one of the founders of the law of the Conservation of Energy which was propounded the same year by Joule in a lecture in Manchester, in which he gave 'the first full and clear exposition of the universal conservation of that principle now called energy.' His ideas met with a hostile reception, not only in Manchester, but also from the Brit. Association itself at its meeting in Oxford that year.

Fortunately the attempt made to stifle the discussion of the paper by the illustrious chairman was frustrated by the enthusiasm of a young man in the audience, Wm. Thomson, afterwards Lord Kelvin (*q.v.*), and from that date the real importance of the principle began to be realised. Expressed in simple terms, the First Law of T. states that work and heat are equivalent. It is an excellent example of a physical law, *viz.* a law that is based on physical measurements and claims to be a law only in so far as it is justified by those measurements. Refined experiments, notably by Callendar and Barnes, and by Reynolds and Moody, have confirmed Joule's conclusions, and the accepted quantitative relation between heat and work is 1 calorie =  $4.186 \times 10^7$  ergs or 4.186 joules. Expressed mathematically the law is written  $W = H$ , where both are expressed in the same units. A conservative preference for retaining the original units leads to the usual expression  $W = 4.186 \times 10^7 H$ , where  $W$  is measured in ergs and  $H$  in calories. The First Law of T. is a *sine qua non* of the Kinetic Theory of Matter that regards heat as the kinetic and potential energy of the molecules of a substance. Further, its importance in leading to the recognition that Heat, Light, Electricity, and Sound are all forms of energy cannot be too strongly emphasised.

T., however, had its origin in an attempt by Carnot 'to determine mathematically how much work can be gotten out of a steam-engine.' Carnot's researches were published in 1824, when he still held to the caloric theory. His theories were subsequently modified by Wm. Thomson to accord with the dynamical theory of heat as expressed in the First Law of T. Carnot began by considering an ideal heat engine, performing in a manner that enabled him to deduce the relation between the work done by the engine and

the heat taken in from the furnace. A modern statement of his principles is as follows: Carnot's engine, Fig. 1, is a cylinder  $C$  fitted with a frictionless and air-tight piston  $D$ . The piston and the

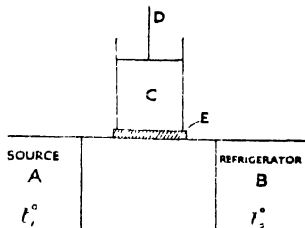


FIG. 1

sides of the cylinder are supposed to be perfect non-conductors of heat, while the base is a perfect conductor of heat. The cylinder  $C$  can be placed either on a non-conducting slab  $E$  or in contact with the source of heat  $A$  at temp.  $t_1^\circ$  or with the 'refrigerator,' or, as we should say, condenser,  $B$  at temp.  $t_2^\circ$ . The cylinder may contain air or any other working substance under pressure. Fig. 2 is the Watt's indicator diagram of the Carnot cycle of operations performed by the engine. The cycle consists of parts of two isothermals  $AB, CD$ , corresponding to the temps.  $t_1^\circ, t_2^\circ$ , and parts of two adiabatics  $AD, BC$ . The four stages corresponding to the parts  $AB, BC, CD, DA$  of a complete cycle are as follows: (i) The cylinder is placed in contact with the hot source  $t_1^\circ$  and the piston is allowed to rise slowly so that while the working substance expands it takes up heat from the source, so that its temp. remains constant at  $t_1^\circ$ . This isothermal expansion is represented by  $AB$  on the indicator diagram. (ii) The cylinder is now placed on the non-conducting slab  $E$  and the piston is allowed to rise still further. The expansion is adiabatic, *i.e.* no heat is communicated to or abstracted from the working substance during this expansion, in which the temp. falls from  $t_1^\circ$  to  $t_2^\circ$ ; the expansion is represented by  $BC$  on the indicator diagram. (iii) The cylinder is now placed in contact with the condenser  $t_2^\circ$  and the piston is slowly driven inwards, so that while the working substance is compressed it gives up heat to the condenser and its temp. remains constant at  $t_2^\circ$ . The isothermal compression is represented by  $CD$  in the indicator diagram. (iv) The final stage is an adiabatic compression. The cylinder is placed on the non-conducting slab, and compressed so that its temp. rises from  $t_2^\circ$  to  $t_1^\circ$ . The adiabatic compression is represented by  $DA$  in the indicator diagram.

The cycle of operations is now complete. We can deduce the efficiency of this engine in the following way. Let  $Q_1$  be the heat absorbed by the working substance while

in contact with the hot source during the isothermal expansion; let  $Q_1$  be the heat rejected by the working substance to the condenser during the isothermal compression. The mechanical work done by the engine during one complete cycle is then represented by the area  $ABNLA + BCPNB - DCPMD - ADMLA =$

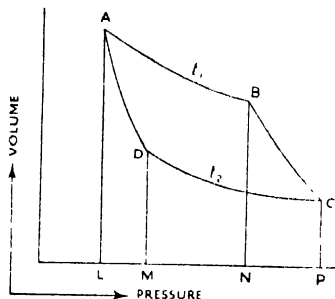


FIG. 2

area  $ABCD$ . By the First Law of T. this work  $W =$  net heat converted into work. Hence  $W = Q_1 - Q_2$ , since no heat is transferred to or from the substance during the adiabatic changes. The efficiency of an engine being defined as the ratio of the mechanical work done to the heat taken in at the source, the efficiency of the Carnot engine is  $\frac{W}{Q_1}$  or  $\frac{Q_1 - Q_2}{Q_1}$ .

**Reversible Engines.**—Carnot's engine is an ideal one, but it gives us a start in the development of the subject. A reversible engine is not merely one that will work in the reverse direction, reverse in the sense that the cycle is performed backwards and work is converted into heat, but one that works backwards so that at each stage of the process the heat taken up (or rejected) is exactly equal to the heat rejected (or taken up) in the forward process. Furthermore, the work done by the engine in the reversed process must be exactly equal to the work done by the engine at the corresponding stage of the forward process. The conditions for reversibility in this sense include (i) complete absence of frictional forces causing a dissipation of mechanical work; (ii) that no conduction of heat shall take place; (iii) that pressure differences between the working substance and the external atmosphere shall always be so small that 'free' expansion does not take place at any stage. It is clear that no real engine is reversible. Nevertheless, in accordance with the usual practice of discussing the mathematical physics of ideal processes in order to develop the underlying theory of engineering processes, the study of reversible engines leads to valuable results. Carnot's engine is a reversible engine, and from a study of its performance we are led to the conclusion known as *Carnot's*

**Principle**, viz. no heat engine working between two given temps. as source and condenser respectively can be more efficient than a reversible one. The formal proof of this principle depends on *The Second Law of T.* Two equivalent statements of this law are as follows: *It is impossible for a self-acting machine, unaided by any external agency, to convey heat from one body to another at a higher temperature* (Clausius). In other words, heat cannot of itself pass from one body to a hotter body. Kelvin's statement of this law reads: *It is impossible by means of unaided material agency to derive mechanical effect by cooling a body below the temperature of the coldest of the surrounding bodies*. In other words, work cannot be obtained by using up the heat of the coldest body of a system.

The Second Law applies only to complete cyclical processes; there is no direct proof of this law. Our confidence in it depends on the fact that it accords with our practical experience, and no objection to it has yet been upheld. The meaning of the law may be realised from the approximate statement that an engine must work by drawing heat from a furnace and rejecting heat to a condenser. If the condenser is at the same temp. as the furnace, the engine will not work; further, the engine will not work by using up the heat of the condenser and rejecting heat to the furnace.

**Proof of Carnot's Principle.**—Let  $A$  be a reversible engine, and let  $B$  be an engine working between the same source and condenser as  $A$ . Then it follows that the efficiency of  $B$  cannot be greater than that of  $A$ . For suppose it is; let the two engines be coupled together so that  $B$  working forwards drives  $A$  working backwards, and let  $B$  take up a quantity of heat  $Q$  from the source, while the amount of working substance in engine  $A$  is adjusted so that it delivers  $Q$  to the source when working backwards. If  $B$  rejects a quantity of heat  $Q_B$  to the condenser while  $A$  takes up a quantity of heat  $Q_A$  from it, then the efficiency of  $B$  is  $\frac{Q - Q_B}{Q}$ , while that of  $A$  is  $\frac{Q - Q_A}{Q}$ .

Since the former is supposed to be greater than the latter

$$\frac{Q - Q_B}{Q} > \frac{Q - Q_A}{Q}$$

The work done by  $B$  is  $Q - Q_B$ ; that done by  $A$  is  $Q - Q_A$ . Hence the compound engine can do an amount  $Q_A - Q_B$  of work in an external system. Now the net loss of heat from the source is zero, while the net loss of heat from the condenser is  $Q_A - Q_B$ . Hence this compound engine does work by using up the heat of the condenser. This violates the Second Law of T. Hence  $\frac{Q - Q_B}{Q}$  cannot be greater

than  $\frac{Q - Q_A}{Q}$ , i.e. no engine can be more efficient than the reversible one working between the same source and condenser. Similarly it may be proved of all reversible engines working between the same source and condenser. It is interesting to note

that the most efficient heat engines, the steam turbines, actually used to-day have an efficiency of about 33 per cent, and the efficiency of Diesel engines may be as high as 38 per cent.

The whole science of T. is based on the two laws already stated. From this point, however, the science develops along two main lines: (i) its applications to heat engines, (ii) to pure T., a powerful method of analysis in deriving a variety of important physical and chemical results. The theory of heat engines derives much from the theory of pure T.

#### Kelvin's Absolute Scale of Temperature.

—The definition of a scale of temp. is given under THERMOMETER. Kelvin's absolute scale of temp. is independent of the properties of any thermometric substance and it is absolute in this sense. It is derived as follows: Let  $Q_1$  be the heat taken in at temperature  $t_1$  by a reversible engine, and let  $Q_2$  be the heat it rejects to the condenser at temperature  $t_2$ . Then its efficiency is  $\frac{Q_1 - Q_2}{Q_1}$  and by Carnot's

Principle this is the efficiency of all reversible engines working between the source and condenser. Hence  $\frac{Q_1 - Q_2}{Q_1}$  or

$(1 - \frac{Q_2}{Q_1})$  depends only on  $t_1$  and  $t_2$ , or

mathematically,  $\frac{Q_1}{Q_2} = f(t_1, t_2)$  where  $f$  is

some unknown function. Suppose we have two reversible engines, one working between  $t_1$  and  $t_2$  and the other between  $t_2$  and  $t_3$ , adjusted so that the first absorbs  $Q_1$  from the source and rejects  $Q_2$  to the condenser, while the second absorbs  $Q_2$  from its source and rejects  $Q_3$  to its condenser.

Then  $\frac{Q_1}{Q_2} = f(t_1, t_2)$  and  $\frac{Q_2}{Q_3} = f(t_2, t_3)$ .

If these engines are coupled together they will act as a compound reversible engine absorbing  $Q_1$  at the source  $t_1$  and rejecting  $Q_3$  to the condenser at  $t_3$ .

Hence  $\frac{Q_1}{Q_3} = f(t_1, t_3)$ . But  $\frac{Q_1}{Q_3} = \frac{Q_1}{Q_2} \cdot \frac{Q_2}{Q_3}$ .

Hence  $f(t_1, t_3) = f(t_1, t_2) \cdot f(t_2, t_3)$ .

$$\therefore f(t_1, t_2) = \frac{f(t_1, t_3)}{f(t_2, t_3)}$$

Suppose, now,  $t_3$  is some standard temp. while  $t_1$  and  $t_2$  are variable. Then  $f(t_1, t_3)$  may be written as  $\phi(t_1)$ , where  $\phi$  is some different function, and  $f(t_2, t_3) = \phi(t_2)$ .

Hence  $f(t_1, t_2) = \frac{\phi(t_1)}{\phi(t_2)}$

and therefore  $\frac{Q_1}{Q_2} = \frac{\phi(t_1)}{\phi(t_2)}$ .

Kelvin therefore adopted a scale of temp. on which  $\phi(t_1) = T_1$ ;  $\phi(t_2) = T_2$ . Hence

$$\frac{Q_1}{Q_2} = \frac{T_1}{T_2}. \text{ In other words, on the}$$

Kelvin scale of temp. the ratio of two temps. is defined as the ratio of the heat absorbed at the source to the heat rejected to the condenser by a reversible engine working between those two temps. In view of Carnot's Principle the ratio  $\frac{T_1}{T_2}$

is the same whatever be the working sub-

stance in the engine, i.e. this scale is independent of the peculiar properties of any thermometric substance, and it is therefore absolute.

A T. thermometer consists of a series of reversible engines each doing the same amount of work  $W$  in a cycle. The first takes in  $Q_1$  at temp.  $T_1$  and rejects  $Q_2$  at temp.  $T_2$ ; the second takes in  $Q_2$  at temp.  $T_2$  and rejects  $Q_3$  at temp.  $T_3$ ; etc.

But  $W = Q_1 - Q_2 = Q_2 - Q_3 = \dots$  etc., and from above,  $\frac{Q_1}{T_1} = \frac{Q_2}{T_2} = \frac{Q_3}{T_3} = \dots$  etc.

$\therefore T_1 : T_2 = T_2 : T_3 = T_3 : \dots$  etc.

Thus equal intervals of temp. are indicated on the absolute scale of temp. When we reach the temp. 0° on this scale the above equations show that the heat rejected to the condenser is zero, i.e. the condenser at that temp. cannot give up any heat to an engine using it as source. This is therefore the lowest possible temp., and the zero of the absolute scale of temp. is the absolute zero of temp. The Kelvin scale is, of course, an ideal scale, but the scale of a perfect gas thermometer can be shown to coincide with its indications. Now although there is no gas that is perfect, it is possible to reduce the readings of a gas thermometer such as the hydrogen thermometer, to those of the ideal perfect gas thermometer. Hence all thermometer readings can be referred to the absolute scale of temp., thus avoiding the idiosyncrasies of the different thermometric substances.

**Entropy.**—If a substance undergoing a reversible change takes in a quantity of heat  $dQ$  at temp.  $T$ ,  $\frac{dQ}{T}$  is called the in-

crease of *entropy* of the substance. All natural processes are irreversible, and it can be shown that there is always an increase of entropy in such processes. Increase of entropy is accompanied by a loss of available energy in a system. Hence it follows that the processes of radiation, convection, conduction, etc., that involve an increase of entropy of the material universe also involve a loss of available energy in the universe. The entropy of the universe tends to a maximum that will be reached when all temp. differences have disappeared. The available energy in the universe will then be exhausted (Second Law of T.) and the universe will suffer, what Jeans terms a 'Heat-death.' See T. H. Preston, *Theory of Heat*, 1929; J. H. Duncan, *Steam and other Engines*, 1929; J. R. Partington, *A Textbook of Thermodynamics*, 1949.

**Thermo-electricity**, see under ELECTRICITY AND MAGNETISM (CURRENT ELECTRICITY).

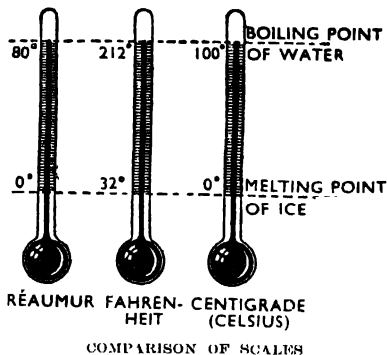
**Thermograph**, instrument used for automatically recording temp., frequently the temp. of the air. The 'Richard T.' is a Bourdon tube, a curved metal tube containing a suitable liquid. Rise or fall of temp. respectively straightens or increases the curvature of the tube by the alteration in the vol. of the liquid. The movement is transmitted by levers to a pen, which makes a trace on a revolving drum. Other patterns use a

bimetallic spiral (Met. office pattern), an electrical resistance element, a steel bulb filled with mercury connected by capillary tubing to a Bourdon tube (distance T.), or consist of a revolving drum of prepared paper on which is photographed the position of a bubble of air introduced into the mercury column and which moves up and down with the temp.

**Thermometer and Thermometry** (Gk. *θερμη*, heat, *μετρον*, a measure). The thermometer is any instrument that measures the variations of sensible heat or temp. (*q.v.*). The effects of temp. on different substances vary considerably, but ignoring the promotion or retardation of chemical action and modification of the properties of matter, we can deal with the relevant change for the present purpose—expansion or contraction. In general, a rise of temp. causes bodies to expand and a fall of temp. causes them to contract, and although there are exceptions to this rule, they do not affect the metals and liquids used in thermometers. Mercury as a thermometric liquid has many advantages over other liquids, amongst which may be noticed its wide range ( $-40^{\circ}\text{C.}$  to  $356^{\circ}\text{C.}$ ) in the liquid state; its regular expansion which is very nearly, though not quite, proportional to changes of temp.; its utility in the capillary tubes which it does not 'wet'; and the expeditious way of obtaining it in a very pure form. On the other hand, alcohol has a lower range (to  $-80^{\circ}\text{C.}$ ) while pentane can be used to  $-200^{\circ}\text{C.}$

Temp. can be ascertained by noticing the change in the volume of a body or a liquid, and any apparatus constructed on this principle can be called a thermometer. Two temps. are taken as points of reference; that of melting ice and that of steam given off by water boiling under normal atmospheric pressure, which is 760 mm. of mercury. This is essential as boiling point is affected by atmospheric pressure. Many other precautions and refinements are necessary in the manufacture of thermometers and for these details readers are referred to any standard work on Heat. Three thermometers are in general use, the Centigrade (or Celsius) (the centesimal scale was adopted by Celsius in 1742), the Fahrenheit and the Réaumur. On the Centigrade scale the freezing point is taken as zero and the boiling point as  $100^{\circ}$ ; the space between being divided into 100 equal intervals, each known as a degree. Graduations on the same scale are extended on either side of these standard points, those below freezing point being negative. This scale is usually employed for scientific purposes. On the Fahrenheit scale the freezing point is marked  $32^{\circ}$  and the boiling point  $212^{\circ}$ , so that  $180^{\circ}$  correspond to the range between freezing point and boiling point, and hence  $100^{\circ}\text{C.}$  are equal to  $180^{\circ}\text{F.}$  or, expressed more simply,  $5^{\circ}\text{C.} = 9^{\circ}\text{F.}$  On the Réaumur scale the freezing point is also taken as zero, like the Centigrade scale, but the boiling point is taken as  $80^{\circ}\text{C.}$  This thermometer is used in some European countries for medical and domestic pur-

poses just as the Fahrenheit thermometer is in Great Britain. Clinical thermometers in the latter country are always Fahrenheit.

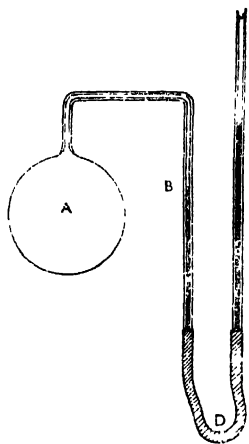


Maximum and minimum thermometers for recording highest and lowest temps. vary in construction. Rutherford's maximum self-registering thermometer consists of an ordinary mercury thermometer placed in a horizontal position, and having a small piece of steel inside the tube beyond the mercury. As the mercury expands with increase of temp. it pushes the steel before it, and as it contracts it leaves the steel in the furthest position to which it has been driven. The end of the steel nearest the surface of the mercury marks the highest temp. since it was last set. The instrument can be reset for another observation by means of a magnet. The minimum thermometer contains alcohol instead of mercury and inside the alcohol contained in the tube there is a small index of glass, with the furthest end touching the surface of the alcohol. This tube is also placed horizontally. As the alcohol contracts it carries the index of glass with it, but when it expands the index is left behind. Thus the end of the index nearest the surface of the spirit shows the lowest temp. The index can be again got into position by inclining the tube.

In addition to the usual thermometers in which mercury, alcohol, etc., measure the changes in temp., there are other types, such as the metallic thermometer, the platinum resistance thermometer, the thermo-couple thermometer, and the gas thermometer. The metallic thermometer—the best known instrument of this class is Breguet's thermometer—depends on the principle that if two strips of different metals with unequal coefficients of expansibility be soldered together and wound into a spiral with the most expansible metal inside, a rise of temp. causes the spiral to unwind. This is due to the greater expansion of the inner strip, and similarly, a fall of temp. causes the spiral to wind up. A needle deflected in the process of winding or unwinding indicates the variation in temp. In the platinum

resistance thermometer use is made of the well-known fact that the resistance of platinum to an electric current varies with change of temp. The Wheatstone's Bridge enables us to detect very small changes in resistance and hence the small changes in temp. can be determined. The thermocouple thermometer is based on the principle of the thermo-couple—that electric currents can be produced by applying heat or cold to one of the junctions in a circuit composed of two different metals. If a very delicate galvanometer is used to measure the current the temp. can be deduced, and temps. up to  $1500^{\circ}\text{C}$ . can be measured with great accuracy in this way. A gas thermometer is much more sensitive than the ordinary types of thermometers, owing to the relatively large coefficient of expansion of gas. It suffers from the defect that it is cumbersome and also requires a large amount of the liquid the temp. of which is to be found.

The figure shows essential parts of a



CONSTANT VOLUME AIR THERMOMETER

simple gas thermometer known as the Constant Volume Air Thermometer. The large bulb *A* and the connecting wide capillary tube contain air or hydrogen, etc., while the tubes *BDC* form a simple manometer. The instrument is calibrated by placing the bulb in clean, melting ice and allowing the air to take up the temp. of the ice. The vertical tube *C* is now raised or lowered until the mercury in the vertical tube *B* is brought opposite some convenient graduation on a scale mounted between *B* and *C*, and the pressure of the air in the bulb is then read off from the manometer. In the present instance this pressure would be  $P + H$ , where  $P$  is the height of the mercury barometer and  $H$  is the vertical height of *C* above *B*. Suppose this pressure is called

$p_0$ . The bulb is now placed in boiling water and the tube *C* is again adjusted to bring the mercury in *B* back to the same graduation as before. Hence the name constant vol. air thermometer. Let  $p_{100}$  be the pressure of the air in the bulb at the boiling point of water taken as  $100^{\circ}\text{C}$ , 760 mm., see previous remarks on atmospheric pressure and boiling point. Then a rise of  $1^{\circ}\text{C}$ . on this thermometer is defined as the rise of temp. that produces an increase of pressure of the constant vol. of air of amount  $\frac{p_{100} - p_0}{100}$ . The temp. corresponding to any pressure  $p$  of the constant vol. of air will be  $\frac{p - p_0}{p_{100} - p_0} \cdot 100^{\circ}\text{C}$ .

See J. Smith, *Pressure Gauges, Indicators, Thermometers, Pyrometers*, 1924; L. B. Hart, *Introduction to Advanced Heat*, 1928; T. H. Preston, *Theory of Heat*, 1929; R. G. Mitton, *Heat*, 1939; and W. E. K. Middleton, *Meteorological Instruments*, 1913.

**Thermoplastics**, see under PLASTICS.

**Thermopylae**, often called simply *Pylae*, celebrated pass leading from Thessaly into Laeiris. The pass of T. is especially celebrated on account of its heroic defence by Leonidas against Xerxes, 480 B.C.

**Thermosetting in Plastics**, see under PLASTICS.

**Thermos Flask**, see VACUUM FLASK.

**Thermostat**, instrument for maintaining an appliance set at a predetermined temp. All Ts. comprise essentially an element extremely sensitive to temp. changes and a switch or lever. For the temp. element use is made of one or other of the following properties: the expansion of metals; the increase in vol. of a liquid; the increase in pressure of a fluid.

Ts. which depend upon the expansion of metals are known as the bi-metal type and consist of a composite strip of two metals with widely different coefficients of expansion. This strip may be used flat or formed into a coil, one end being free and the other fixed. When the temp. alters, the unequal expansion of the two metals causes distortion, and an appreciable movement is produced at the free end which in turn moves the switch or lever. A magnet is sometimes used in the bi-metal type so that the completion of the closing operation is positive and quick; this is useful in the control of an electrical device to prevent any sparking which might be caused by a poor contact. The two metals usually used are brass, which has a large expansion, and a steel alloy with a negligible expansion. For liquid heating control the composite strip is in a brass tube which is inserted in the medium. Bi-metal Ts. are used for many types of temp. control among which may be mentioned the regulation of boilers, immersion heaters, cookers, and space heating.

The second type of T. consists of a cylindrical bulb, a capillary tube, and a metallic bellows. The system is completely filled with a liquid and sealed, so that the only way in which the liquid can expand when the temp. rises is by pressure

on the bellows. Attached to the latter is a rod with spring adjustment which moves the device attached to it. The bellows type is often used where it is necessary or desirable for the sensitive element to be at a distance from the switch or lever. It is used in most refrigerators and in some air-conditioning plants. In space-heating the sensitive bulb is mounted directly on the bellows.

The third or vapour pressure type T. is similar to the second except that the system is only partially filled with a volatile fluid of a low boiling point leaving a vapour space. As the pressure of the vapour will vary according to the temp., movement will again be produced by the bellows. See also FIRE BRIGADES AND FIREFIGHTING, *Fire Alarms*. See R. Griffiths, *Thermostats and Temperature Regulating Instruments*, 1950.

**Thesaurus**, see under DICTIONARY.

**Theseus**, great legendary hero of Attica, son of Ægeus, king of Athens, and of Æthra, the daughter of Pittheus, king of Troezen. He was brought up at Troezen, and when he reached maturity he took his father's sword and sandals, and went to Athens. Having been acknowledged by Ægeus as his heir, and after slaying the Marathonian bull, T. went of his own accord as one of the seven youths whom the Athenians were obliged to send every year, with seven maidens, to Crete, in order to be devoured by the Minotaur. When they arrived at Crete, Ariadne, the daughter of Minos, became enamoured of T., and provided him with a sword with which he slew the Minotaur, and a clue of thread by which he found his way out of the labyrinth. Having effected his object, T. sailed away, carrying off Ariadne. He was generally believed to have had by her two sons, Erichon and Staphylus. As the vessel in which T. sailed approached Attica, he neglected to hoist the white sail, which was to have been the signal of the success of the expedition; whereupon Ægeus threw himself into the sea. T. thus became king of Athens. One of the most celebrated of the adventures of T. was his war with the Amazons whose queen, Antiope, bore him a son, Hippolytus. T. figures in almost all the great heroic expeditions. He was one of the Argonauts; took part in hunting the Calydonian boar, and helped Adrastus to recover the bodies of the slain at Thebes; joined Pirithous and the Lapithæ against the Centaurs; with Pirithous abducted Helen from Sparta and tried to abduct Proserpina from Hades. In this last-named adventure Pirithous perished and T. was held in durance until his liberation by Hercules. Meanwhile Menestheus incited the peoples against T., who, being unable to re-establish his authority, retired to Scyros where he was treacherously thrown headlong from a cliff by the king, Lycomedes and killed. An important addition is made to our knowledge of the legend of T. by the discovery of the *Odes* of Bacchylides (Sir R. C. Jebb's ed., 1905).

**Thesiger, Frederick; Frederick Augus-**

**tus; and Frederick John Napier; see** CHERLMSFORD, BARONS.

**Thesmophoria**, festival in honour of Demeter as the founder of agriculture and patroness of marriage, celebrated widely in Greece and especially at Athens. It was held for five days in the month Pyanepsion (early Nov.), only married women of Attic birth and stainless character taking part. On the first day of the feast (*Στήναι*) there was a procession to the deme or township of Ilalimus. Others, however, say that the T. was in honour of Ceres, surnamed Thesmophoros, the law-giver, that goddess being supposed the first who taught mankind the use of laws. The institution of the festival is variously described, some attributing it to Triptolemus, some to Orpheus, and others to the Danaides. See also MYSTERIES.

**Thespiae**, anct. Gk. city near the base of Mt. Helicon, in Boeotia. Its hist. seems guided by an inveterate hatred for the neighbouring and stronger city of Thebes, which dismantled its walls in 423 B.C., captured it in 372 B.C., and finally razed it to the ground. In 480 B.C. T. did not disgrace itself by siding with the enemy.

**Thespis**, father of Gk. tragedy, lived during the latter part of the sixth century B.C. He introduced into the old tragedy connected with the Dionysian festivals an actor, for the sake of giving rest to the chorus. This actor took various parts in the same piece under various disguises, which took the form of linen masks. See A. E. Haigh, *Tragic Drama of the Greeks*, 1896; A. Croiset, *History of Greek Literature*, 1904; and J. T. Sheppard, *Greek Tragedy*, 1920, 1934.

**Thesprotia**, prefecture of Greece in the Epirus. Pop. 65,000.

**Thessalonians, The Epistles to the**, were probably written by St. Paul from Corinth when he was working there with Silvanus and Timothy (Acts xviii. 5) between A.D. 51 and 53. They are, therefore, among the earliest of St. Paul's epistles, and their genuineness is universally acknowledged. Acts xvii. describes St. Paul's visit to Thessalonica, and of the bad reception he received from the Jews. The Gks. and devout women, however, showed much eagerness to learn his message, and to them he turned. The Epistles, then, which followed each other closely, were addressed to a Gentile audience. The immediate occasion of the First Epistle is the favourable intelligence brought to the Apostle by Timothy of the steadiness with which the Thessalonians adhered to the faith in spite of the persecutions with which they were assailed by their own countrymen. From it we learn what had been St. Paul's message and appeal when he was himself in Thessalonica. He had appealed to the primary feelings of the human heart and then passed on to speak of Jesus 'which delivereth us from the wrath to come' (i. 10). This particular insistence on the Judgment and the Second Advent had led to much questioning, and in the latter part of the letter St. Paul deals with this. His letter, however, did not settle all difficulties, though the news which he



later received from Thessalonica was in many aspects encouraging. The expectation of the immediate coming of the Lord still caused great excitement and the neglect of the duties of daily life. The Second Epistle is intended to allay this excitement. See article in *Hasting's Dictionary of the Bible*: C. Lattey's trans. of the Epistles to the Thessalonians, 1913; H. N. Bate, *Guide to the Epistles of St. Paul*, 1926, and a commentary on the E. to the T. by E. J. Bicknell, 1939.

**Thessalonica**, or **Thessaloniki**, see SALONICA.

**Thessaly**, largest div. of anc. Greece. T. proper is a large plain, drained by the R. Peneios, and its affluents about 70 m. across shut in on every side by mt. barriers, broken only at the N.E. corner by the valley and delta of Tempe, which separates Ossa from Olympus. There were two other dists., included under the general name of T.; one, called Magnesia, being a long narrow strip of country extending along the coast of the Aegean Sea from Tempe to the Pagasæan Gulf, and the other a long narrow vale at the extreme S. of the country, lying between Mts. Othrys and Oeta. Thessaly proper was divided in very early times into four dists. or tetrarchies, a div. which we still find subsisting in the Peloponnesian War. These dists. were: (1) Hestiaeotis, in the N.W.; (2) Pelasgiotis, in the E.; (3) Thessaliotis, in the S.W.; and (4) Phthiotis, in the S.E. It is in this dist. that Homer places Phthia and Hellas proper, and the dominions of Achilles. Besides these there were four other dists., viz.: (5) Magnesia; (6) Dolopia, a small dist. bounded on the E. by Phthiotis, on the N. by Thessaliotis, on the W. by Athamania, and on the S. by Oëta; (7) Oëtaea, a dist. in the upper valley of the Spercheus; and (8) Malis. The Thessalians were a Thesprotian tribe, and invaded the W. part of the country, afterwards called Thessaliotis, whence they subsequently spread over the other parts of the country. The gov. in the separate cities became oligarchical, the power being chiefly in the hands of a few great families descended from the anc. kings. Of these, two of the most powerful were the Aleuadae and the Scopadae. The Thessalians never became of much importance in Gk. hist. In 344 B.C. Philip completely subjected T. to Macedonia. The victory of T. Flamininus at Cynoscephalæ, in 197, again gave the Thessalians a semblance of independence under the Romans. The area of modern T. is given as 5,200 sq. m. and its pop. 569,300. In recent years excavations have been made by the Brit. School of Archaeology in Athens. Mineral deposits exploited include iron-pyrites, copper, zinc, bitumen, and marble.

**Thetford**, mun. bor. and mrkt. tn. of Norfolk, Eng., situated on the borders of the great state forest of Thetford Chase and the Breckland. The Rs. Thet and Little Ouse unite just above the tn. bridge. It was once the cap. of the kingdom of E. Anglia. The earthworks of Castle Hill are one of the largest and most interesting examples of early military

fortifications in England. The site of the Saxon tn. is being excavated by the Ministry of Works. The ruins of the Clunian priory (founded c. 1103) stands on the banks of the Little Ouse. There are remains of the Benedictine Nunnery of St. George and of the monastery of the Canons of the Holy Sepulchre. Pop. (estimated) 9700.

**Thetis**, Gk. mythology, a sea-goddess, daughter of Nereus (q.v.) and Doris, and mother of Achilles. Poseidon and Zeus are said to have sued for her hand; but when Themis (q.v.) declared that the son of T. would be more illustrious than his father, both gods desisted from the suit. Others state that T. rejected Zeus because she had been brought up by Hera and that the god, to revenge himself, decreed that she should wed a mortal; and, at length, she was given against her will in marriage to Peleus (q.v.).

**'Thetis'** Brit. submarine of the Trident class (1090-1575 tons), which on her trial run sank in Liverpool Bay on June 1 (1939) with the loss of 99 lives, only four men being saved. The submarine was beached on Oct. 3 on the Anglesey coast, recommissioned for war service as the *Thunderbolt*, and then finally lost through enemy action off the coast of Sicily on March 13, 1943, with the loss of all hands.

**Thian-Shan**, see TIENSHAN.

**Thibaudet, Albert** (1874-1936). Fr. literary historian b. at Tournus, Saône-et-Loire. From 1925 he was prof. of literary hist. at Geneva. He was chiefly interested in the literature of the late nineteenth century. Among his works are *La poésie de Mallarmé* (1912), *Flaubert* (1922), *Trente ans de vie française* (1920-25), *Intérieurs* (1924), *La république des professeurs* (1927), *Mistral* (1930), *Physiologie de la critique* (1930), *Stendhal* (1931), *Histoire de la littérature française de 1789 à nos jours* (1936). See life by G. Truc, 1935.

**Thibault, Jacques Anatole**, see FRANCE, ANATOLE.

**Thibaw**, or **Hsipaw**, Shan state of Upper Burma, with an area of 5080 sq. m., traversed by the Namtu. Rice, cotton, and tea are the chief articles of produce. Pop. 130,000.

**Thibet**, see TIBET.

**Thielt**, see TIELT.

**Thiers, Louis Adolphe** (1797-1877). Fr. statesman and historian, b. at Marseilles of humble parentage. In 1821 he entered the offices of the *Constitutionnel*, his articles in which quickly placed him in a position of independence. Journalism not satisfying his ambition, he collaborated with Félix Bodin in the production of *Histoire de la révolution française* (1823-27), the greater part of which was the work of T. In 1830, his antipathy to the Bourbons prompted him to seek a more vigorous polemical field than that of the *Constitutionnel*, and he founded the *National*, which helped to provoke the revolution of that year. After the nomination of Louis Philippe as king of Fr. T. was rewarded for his publicist services by being nominated a councillor of state and given a post in the Treasury.

Later he became under-secretary of state to the treasury (1831), supporting the peace policy of Casimir Périer. T. was minister of the interior in Soult's cabinet of 1832 during the Paris insurrection. Four years later he was placed at the head of the cabinet, and carried out, among other liberal reforms, the suppression of lotteries and gaming-houses, and the reduction of tariff duties on inland trade. In 1840 he became president of the council and foreign secretary. He supported Mehmet Ali against Turkey with the object of assuring to the latter the retention of Egypt. Later, after the conclusion of peace between England, Russia, Turkey, Prussia, and Austria, he made all preparations for war as a demonstration against the exclusion of France from the European concert, but his policy resulted only in the prompt recalling of the Fr. fleet from Turkish waters and his own retirement. He then devoted himself to writing historical works, and pub. his huge work, the *Histoire du Consulat et de l'Empire* (1845-69). After the proclamation of the republic on the fall of Louis Philippe's gov., T. made strenuous efforts to overthrow the republic while appearing to support it, but he was banished from Fr. ter. on the subsequent restoration of the empire, whither he did not return till 1852. In 1863 he was nominated deputy for one of the divs. of Paris. On the fall of the empire following upon the débâcle at Sedan, he was elected president of the assembly, and shortly after became president of the republic. In 1873, wishing to avoid being made the instrument of monarchist intrigue, he voluntarily resigned.

See R. Dreyfus, *Thiers contre l'Empire, la guerre, et la Commune 1869-71*, 1928; and life by M. Rochus, 1932.

**Thiers**, tn. in the dept. of Puy-de-Dôme, France, on R. Durolle. There are important manufs. of cutlery, whale-bone, and bank-note paper. Pop. 15,400.

**Thigh**, the part of the lower limb between the pelvis and the knee. The T.-bone, or *femur*, is the longest bone in the human body, constituting about 0.275 of the height from sole to crown. It articulates with the *os innominatum* above, and with the *tibia* below.

**Thionville**, tn. in the dept. of Moselle, France, situated on the Moselle, 20 m. N. of Metz by rail. The former Ger. name was Diedenhofen. The tn. is of anc. origin and strongly fortified. Imperial diets were held here in the eighth century; in 1870 it surrendered to the Prussians. It has manufs. of wine, hosiery, and iron goods. During the Second World War, the part W. of the Moselle was captured by Amer. forces on Sept. 14, 1944, but the Gers. held the E. part until on Nov. 15 they were cut off by Amer. crossings of the riv. to the S.W. and N.E. Pop. 12,000.

**Thiophene**, C<sub>4</sub>H<sub>4</sub>S, a colourless liquid (b.p. 84° C.) discovered in 1883 by Victor Meyer as an impurity in benzene obtained from coal tar. It gives a blue coloration with iastin dissolved in concentrated sulphuric acid, and in its general prop-

erties closely resembles benzene (*q.v.*). T. may be separated from benzene by prolonged shaking with cold concentrated sulphuric acid, which removes the T.

**Thiosulphate of Soda**, see HYPO.

**Third**. The interval between the two notes of which lie three degrees of a diatonic scale. Ts. can be major, minor, or diminished, in the last case being equal to major seconds on the pianoforte, but written to look like Ts., *e.g.* C♯-E♭. A diminished T. is the inversion of an augmented sixth. The T. of a diatonic scale is the most characteristic interval determining the difference between major and minor.

**Third Estate**, that Fr. social class which was represented in the states-general, as well as the clergy and nobility.

**Third International or Komintern**, see COMINTERN.

**Third Party Insurance**, insurance against liability to pay damages for personal injuries sustained by third persons or for injuries to the property of third persons. This form of insurance has gained in popularity in view of the fact that the insurer is thereby relieved of the trouble of dealing with the claim, whether genuine or not, and of all legal costs and expenses. In their inception, T.P. policies were taken out in respect of horse-drawn vehicles; other risks were gradually accepted by the insurance companies, until to-day all manner of risks are covered. The largest development has been in regard to motor business, especially since the Road Traffic Act of 1930, under which T.P.I. was made compulsory, and the chief feature of the motor policy now lies in the 'liability to the public' section. (See MOTOR VEHICLE INSURANCE.) Most insurance companies, however, now deal with this class of business as a separate activity. Experts aver that legislation has given no great impetus to T.P.I., though some business accrues as a consequence of the Housing Acts, a class of business known as 'Property Owners' Indemnity' and 'Landlords' Indemnity.' Generally speaking, insurance companies find their third-party depts. profitable; there is considerable competition for the business on its own merits, although freedom in rating has led to some risks being accepted at very low premiums in order to protect tariff-rated insurance against competition. In this connection, however, driving accident insurance and cinema risks are classes of public liability business which have been somewhat fettered by tariffs.

**Third Reich**, term applied to the Ger. National Socialist régime, formally begun on Feb. 1, 1934. The empire of 1871 to 1918, and the succeeding Weimar republic, were the two anterior constitutions.

**Third Republic**, in France, lasted from the fall of the Second Empire (*q.v.*) in 1870 to the surrender of the Fr. Gov. on June 17, 1940.

**Third Silesian War**, see SEVEN YEARS' WAR.

**Thirlage**, in old Scots law, that servitude by which possessors of lands in some parts of the country were bound to grind

their grain at a particular mill—to which mills the lands were said to be 'astricted' or 'thirled.'

**Thirlmere**, lake of the Lake District, Cumberland, England,  $3\frac{1}{2}$  m. S.S.E. of Keswick. It is 3 m. in length and about  $\frac{1}{2}$  m. in width, with a depth of nearly 100 ft. It is surrounded by lofty heights; on its E. shore rise Helvellyn and White-side, whose slopes are well wooded, while on its W. side are Arnboth Fells and Raven Crag, whose slopes are cut by mountain torrents. T. affords part of the water supply of Manchester.

**Thirsk**, mkt. tn. and rural dist. of the N. Riding of Yorkshire, England. 22 m. from York. It has a beautiful par. church. Its fairs and mkt.s. are noted, and a trade is carried on in livestock, corn, wool, timber, etc. With the par. of Sowerby (pop. 2500), it forms one continuous built-up area. Pop. 2500.

**Thirst**, desire for drink, made known by sensations projected to the pharynx. The amount of water contained in the body is subject to great changes. It is always being lost by various organs, the amount lost varying greatly with the conditions of life. This loss directly affects the blood, but this is not lasting, as the blood draws upon the vast resources of the other body tissues for its supply of water; consequently the tissues require a new supply to restore them to their normal state. The sense of T. then comes into play; we become thirsty and take into our bodies water in varying quantities according to our needs. Little is known concerning the nervous mechanism controlling this sensation, but it is assumed that as the water content falls below a certain amount the nerves in the pharyngeal region are stimulated and so give rise to T.

**Thirty-Nine Articles**, The, of the Church of England are described in their heading as 'Articles agreed upon by the archbishops and bishops of both provs. and the whole clergy, in the Convocation held at London in the year 1562, for the avoiding of diversities of opinions, and for the establishing of consent touching true religion.' Their hist., however, begins before this date. On the death of Henry VIII., the gov. of the country was left in the hands of a group of nobles, of whom many were in favour of the reformed doctrines, and the changes in the teaching and practice of the Church increased with great rapidity. The ancient landmarks were being removed, and it was desirable that fresh ones should be set up. In 1549, Parliament empowered the king to appoint a commission for the drawing up of eccles. laws, and in accordance with this Act a commission was appointed in 1551 consisting of eight bishops, eight divines, eight lawyers, and eight other representatives of the laity. This commission, which included Cranmer, Ridley, Coverdale, and Peter Martyr, began by drawing up a code of forty-two articles which were pub. by royal authority in 1553. To these articles was prefixed Cranmer's *Catechism*. In the same year Edward VI. died, and the Con-

vocation of the first year of Mary denied that the articles had received its consent, and entirely repudiated them. The tide of reformation was thus stemmed for a while, but on the accession of Elizabeth it was resumed. This period is marked by greater moderation. Parker occupied the see of Canterbury, and he submitted to Convocation a revised form of the original forty-two articles. These underwent considerable further alterations, in course of which they were reduced in number to thirty-nine and were finally promulgated in 1571. The first half of the twentieth article was omitted in some copies, and there continued to be some discussion as to which was the authorised form, until in 1604 they were finally settled in the form in which they are now used. The T. A. were adopted by the Convocation of the Irish Church in 1635, and by the Scottish Episcopal Church in 1804. There has been, especially during the last century, much controversy as to the nature and meaning of the articles. Some have tried to interpret them as an orderly body of divinity, but they were probably devised for a special need, and bear the marks of compromise in every line. They are, indeed, chiefly negative, condemning the errors of the medieval Church and those of certain of the Protestant sects. They are, on the whole, Calvinistic in tone, but their extreme elasticity has been well shown by Newman and Jowett. The former of these, in the famous *Tract XC.*, attempted to prove that they were in no way contrary to the Decrees of Trent. Commentaries are those of W. Beveridge (1716), and Harold Browne (1850). See W. H. G. Thomas, *The Principles of Theology, an Introduction to the Thirty-Nine Articles*, 1930; *Introduction to the Thirty-Nine Articles*, 1916.

**Thirty Years' War**, The. Practically it may be said that the T. Y. W. was the result of the Ger. Reformation and the Counter-Reformation. The war began in 1618 by the offer of the crown of Bohemia to the Lutheran prince, the elector of the Palatinate, son-in-law of James I. of England and father of the Princes Rupert and Maurice. The troops of the Emperor immediately entered Bohemian ter. and drove out Frederick, depriving him also of his electorate of the Lower Palatinate, a task rendered more easy by the inactivity of James I. of England. The ter. so annexed by the Emperor Ferdinand were handed over to Maximilian of Bavaria and so became Catholic; an illustration of the sixteenth-century principle that the religion of the prince is also the religion of his subjects. The Hapsburgs now developed their policy on large lines; Germany was to become a Hapsburg possession and the ter. lost to Catholicism by the Reformation was to be regained. The imperial generals, Tilly and Wallenstein, swept all before them; N. Germany and the Baltic ports seemed to lie at their mercy. Christian IV. of Denmark came forward as the champion of Ger. Protestantism, but was defeated and forced to make peace in 1629 (Lübeck). Wallenstein had estab.

the Hapsburg supremacy in the N., but had failed to take Stralsund. In the following year Gustavus Adolphus, aided by Fr. subsidies, came forward as the champion of Protestantism, and with his appearance began the turn of the tide. Wallenstein had been dismissed at the Diet of Ratisbon; the Ger. princes feared the man whom they regarded as a mere mercenary upstart. Gustavus Adolphus marched from victory to victory. Tilly was defeated at Breitenfeld, and Gustavus marched to the S. In 1631 he again defeated and killed Tilly on the banks of the Lech, and then Wallenstein was recalled. Gustavus won the battle of Lutzen (1632), but was killed, and much of his work was undone. From this point the religious motives of the war entirely disappear. France, anxious to break the power of the Hapsburgs, gave support to the Swedes and Ger. Protestant princes. Richelieu played his hand well; enemies to the Hapsburgs were raised up in Germany, Italy, and Spain; the Dutch were given support in their struggle against Sp. power; and the power of the Hapsburgs, both Austrian and Sp., began to decline. The policy of Richelieu was continued after his death by Mazarin, and the Fr. generals Condé and Turenne won brilliant victories over the imperialists. Finally the end came in 1648, when the Emperor, suffering from defeats in Germany at the hands of the Swedes and the Fr., agreed to terms of peace. The Peace of Westphalia was signed in Oct. 1648. The territorial gains of France and Sweden, and the independence of the Ger. princes, were recognised. The attempted revival of the power of Catholicism by the sword had failed, and the imperial power became nominal elsewhere than in Austria. The independence of Portugal and the United Provinces (Holland) was also recognised by this treaty. See S. R. Gardiner, *The Thirty Years' War* (11th ed.), 1898; H. G. R. Reade, *Sidelights on the Thirty Years' War*, 1925; and C. V. Wedgwood, *The Thirty Years' War*, 1944.

**Thisbe**, see PYRAMUS and THISBE.

**Thistle**, name given to various composite plants of which the best known are those that belong to the genera *Carduus* and *Cnicus*. Others are the Scotch T. (*Onopordion acanthium*); the Carlue T. (*Carlina vulgaris*); the Globe T., which belongs to the genus *Echinops*; and the Hedgehog T. (*Echinocactus*). The Holy T. is *Silphium marianum*. Its roots and young leaves are edible.

**Thistle-finch**, Black-headed, see SISKIN.

**Thistle, Order of the**, see ORDERS OF KNIGHTHOOD.

**Thistleton-Dyer**, Sir William Turner, see DYER.

**Thistlewood Conspiracy**, see CATO STREET CONSPIRACY.

**Thomas**, tn. of Portugal. Here are ruins of a Templar's castle, the famous convent of the Order of Christ, and the palace of Henry the Navigator. There are gold mines in the vicinity. Pop. 37,176.

**Thomas, St.**, one of the twelve disciples, called also Didymus (John xi. 6), a Gk.

trans. of the Heb. form of 'Thomas.' All the information about him in Scripture is given in the Fourth Gospel. Later tradition says that he evangelised India and Parthia, dying at Edessa. His festival falls on Dec. 21.

**Thomas à Kempis**, Saint, see KEMPIS.

**Thomas, Albert** (1878-1932). See under INTERNATIONAL LABOUR ORGANISATION.

**Thomas of Celano**, see CELANO.

**Thomas Aquinas**, or Thomas of Aquino, see AQUINAS, THOMAS.

**Thomas, Arthur Goring** (1850-92), Eng. musical composer, b. at Rotton Park, Sussex. Educ. at Haileybury College, and studied music in Paris and at the Royal Academy, London, under Prout and Sullivan. The success of his *The Light of the Harem* led to the Carl Rosa Company's invitation to write the opera *Esmeralda*, which was successfully produced at Drury Lane (1890). His best opera is *Nadeshu* (1885) (libretto by J. Sturgis). He also composed *The Sun Worshipers* (cantata); *The Swan* and *The Skylark*, and a number of songs.

**Thomas Becket**, see BECKET, THOMAS A.

**Thomas, Bertram Sydney**, Brit. explorer, and orientalist (b. 1892). His crossing of the Rub' al Khali, the great desert of S. Arabia, one of the largest unknown regions in the world, in the winter of 1930-31, is one of the greatest feats of exploration of the present century. T. went with a camel caravan. He was awarded the Founders' Medal of the Royal Geographical Society and the Burton Memorial Medal of the Royal Asiatic Society. Previously, in 1927-28, he had made a 600-m. journey through the southern borderlands from the toe of Arabia nearest India to Dhufar, and in 1929-30 he explored the steppe for 200 m. to the northward of Dhufar, right to the edge of the sands. Pub. *Adarns and Excursions in Arabia* (1931); *Arabia Infelix* (1932).

**Thomas, Dylan** (b. 1914), Welsh poet. Against the intellectual school of W. H. Auden there has been in Eng. poetry a reaction towards the mystic and the romantic, of which T. is a foremost figure. A master of language, rich in imagery, he treats of the elemental processes of human life, his best work being in those poems, such as *In Memory of Ann Jones*, which are unified by a single theme. His new stanza forms will probably have a lasting effect. His publs. include *Eighteen Poems* (1934); *Twenty-five Poems* (1937); *The Map of Love* (verse and prose, 1939); *Portrait of the Artist as a Young Dog* (prose, 1940); and *Deaths and Entrances* (1946). See study by H. Treece, 1949.

**Thomas, Edward**, see THOMAS, PHILIP EDWARD.

**Thomas van Erpen**, see ERPENIUS.

**Thomas, Freeman**, **Freeman**, see WILLINGDON, VISCOUNT.

**Thomas, James Henry** (1874-1949), Brit. Labour politician, b. at Newport, Monmouthshire, son of a labourer. As an engine-driver he was elected to the Swindon tn. council, and in 1904 became president of the Amalgamated Society of

**Railway Servants.** T. was M.P. for Derby 1910-36. In the First World War he was a member of Lord Balfour's mission to the U.S.A., and in 1918 became general secretary to the National Union of Railwaymen; president of the Parl. Committee of Trades Union Congress (1920-21), and president of the International Federation of Trades Unions (1920-21). Vice-chairman of the Parl. Labour Party, 1921, T. was appointed secretary of state for the colonies in the first Labour Gov., 1924, and lord privy seal and minister of employment in the second Labour Gov. (1929-30). In June 1930 he became secretary of state for dominion affairs, being transferred to the Colonial Office in 1935. In 1936 he resigned both from office and from Parliament as a result of the report of a Tribunal set up to consider unauthorised disclosures relating to the Budget. T. was author of *When Labour Rules* (1920); *The Red Light on Railways* (1921); and *My Story* (1937).

**Thomas, Philip Edward** (1878-1917). Eng. author of Welsh extraction, b. in London, eldest son of Philip Henry T., staff-clerk at the board of trade. Educated at St. Paul's School and Lincoln College, Oxford, he enlisted in 1915, became a second-lieutenant, R.G.A., and was killed at Arras, April 9. Much of his prose is in newspaper files, but in his best work the qualities revealed are truth and a love of the countryside of England and Wales. Imagination, having the quality of mysticism, was a characteristic of his prose. His poetry, the late flower of his literary work and written for his own delight, is perhaps his greatest gift to literature. The verse is clear in content. Two of his best poems are *Lights Out and Out in the Dark*. Works include: *The Woodland Life*, a vol. of nature studies, (1897); *Horae Solitariae*, (1902); *Oxford*, (1903); *Beautiful Wales*, (1905); *Richard Jefferies*, (1909); *The South Country*, (1909); *Rest and Unrest*, (1910); *Feminine Influence on the Poets*, (1910); *Light and Twilight*, (1911); *George Borrow*, (1912); *Swinburne*, (1912); *Walter Pater*, (1913); *The Happy-go-Lucky Morgans* (novel), (1913); *In Pursuit of Spring*, (1914); *Collected Poems*, (1920); and *The Last Sheaf*, (1928). See Helen Thomas, *Is it Was* (1926) and *World Without End* (1931).

**Thomas, Richard, & Baldwins Ltd.**, iron, steel, tinplate, etc., manufacturers, producing 10 per cent of Britain's output of steel and employing 8 per cent of the steel industry's labour force; the organisation has interests ranging from the raw materials of the industry to its finished products. Richard Thomas & Co. was registered in 1884, taking over a family business. After 1899 there was continued expansion until by 1914 the company controlled a steelworks and 83 tinplate mills. Further amalgamation in 1917 gave control of coal and iron ore supplies and led to development at the Redbourn Works and the operation of blast furnaces and additional steel furnaces, tinplate mills, etc. A further phase of expansion began in 1933. In 1935 Richard Thomas & Co. acquired the Ebhw Vale site and

erected an integrated plant inclusive of the first wide hot strip mill built in this country, which began to operate in the autumn of 1938. The name of the company was changed to R. T. & B. Ltd. in Jan. 1945 upon fusion with Baldwins Ltd. which had been incorporated in 1902 and represented the amalgamation of sev. oldest estab. undertakings, makers of quality steel products. The company (R. T. & B.) now has a steel ingot capacity of some 1,500,000 tons annually, approximately 250,000 tons of tinplate and 400,000 tons of sheets representing one-third of Britain's output of each of these products. The company's production also includes coke, iron ore, and limestone, as well as pig iron and a variety of steels including stainless, silicon and castings, bricks, slag, etc.

**Thomas, Christians of St.**, oldest Christian church of India, is Nestorian in doctrine, and probably owes its origin to the Nestorians of Persia. Tradition, however, ascribes it to St. Thomas. From 1599 to 1653 they were brought under Rom. jurisdiction, but they now claim entire independence. They number a few hundred thousand and are found in the states of Malabar and Cochin. The liturgical language is Syriac. See G. M. Rae, *Syrum Church in India*, 1892.

**Thomas of Woodstock**, see GLOUCESTER, DUKES and EARLS OF.

**Thomas the Rhymer**, see ERICLDOUNE THOMAS OF.

**Thompson, Alice**, see MEYNELL, ALICE.  
**Thompson, Sir Benjamin, Count Rumford** (1753-1814), Anglo-Amer. scientist and administrator, b. at Woburn, Mass., his family having settled in New England. Early made chemical and mechanical experiments and, by turns, studied medicine and took up school teaching. At 19 he married the well-to-do widow of a Col. Rolfe, and daughter of a minister who had settled at Rumford, now called Concord. This marriage was the foundation of his success, though within a few years he left his wife to settle in Europe. During the war of Amer. Independence his sympathies were opposed to the Amer. cause, and in 1776 he was therefore chosen by Gov. Wentworth of New Hampshire to bear despatches to London and later became an under secretary of state. His official duties, however, did not preclude scientific pursuits, and in 1779 he was elected a fellow of the Royal Society. Among the subjects of which he made special study were ballistic experiments, a differential thermometer, and light-house improvements. A few years later he was introduced to Prince Maximilian, afterwards Elector of Bavaria, and entered the service of that state as minister of war, grand chamberlain, and principal adviser to the elector. In 1791 he was created a count of the Holy Roman Empire, choosing his title of Rumford from his Amer. associations. In 1795 he again visited England and devoted himself to the problems of smoke abatement. In 1799 he co-operated with Sir Joseph Banks in projecting the estab. of the Royal Society. T. himself selected Sir Humphry

Davy as the first scientific lecturer there. He was the founder and first recipient of the Rumford Medal of the Society. His complete works were pub. by the Amer. Academy of Arts and Sciences at Boston in 1872.

**Thompson, Elizabeth** see BUTLER, ELIZABETH SOUTHERDEN, LADY.

**Thompson, Sir Edward Maunde** (1840–1929), Eng. librarian and palaeographer, b. in Jamaica and educated at Rugby and Univ. College, Oxford. He was a co-founder of the Palaeographical Soc., in 1873, of which he became president in 1903. T. was keeper of MSS. in the Brit. Museum (1878), librarian (1888), and one time director there. His chief works are: *Handbook of Greek and Latin Palaeography* (1893), on the course of development of the handwritings of former ages; and *An Introduction to Greek and Latin Palaeography* (1912). He ed. and pub. a number of MSS. from the Brit. Museum.



Burns Oates & Washbourn.

FRANCIS THOMPSON

**Thompson, Francis** (1860–1907), Eng. poet and writer, b. at Preston, Lancs. He was educated atshaw College, near Durham, and afterwards studied medicine at Owens College, Manchester, but failing to take a degree he sought his fortune in London. Here he spent some years in various occupations, until in 1893 he sent a poem to the magazine *Merrie England*. This was at once recognised by Willrid Meynell as a work of merit, who rescued T. from destitution and helped him to publish his first vol. of *Poems*, which were praised by Coventry Patmore in the *Fortnightly Review*. This vol. was followed by *Sister Songs* (1895) and *New Poems* (1897), both of which gave him a recognised place among poets. The most famous of his poems is *The Hound of Heaven*. He also gained a reputation as

a prose writer, and pub. *Health and Holiness* (1905), a treatise dealing with the ascetic life, and an *Essay on Shelley* (1909). *The Works of Francis Thompson* in three vols. were pub. in 1913; *Collected Poetry* in 1924. See J. Thompson, *Francis Thompson, Poet and Mystic*, 1923; E. Meynell, *The Life of Francis Thompson*, 1926; R. L. Megroz, *Francis Thompson, Poet of Earth in Heaven*, 1927; also lives and studies by F. Olivero, 1935 (Eng. trans. 1938), and T. L. Conolly, 1944.

**Thompson Submachine Gun**, see under SUBMACHINE GUN.

**Thoms, William John** (1803–85), Eng. antiquary and miscellaneous writer, b. at Westminster, was for some years a clerk in the secretary's office of Chelsea Hospital, and was appointed Clerk in 1845, and subsequently deputy librarian to the House of Lords. He was founder in 1849 of *Notes and Queries*, which for some years he also edited. He also ed. *Stow's London*, (1842), and was secretary of the Camden Society. He introduced the word 'folklore' into the language.

**Thomsen, Hans Peter Jörgen Julius** (1826–1909), Dan. chemist, passed his life in Copenhagen, teaching chemistry at the Polytechnic (1847–56) and Military High School (1856–66), before he was appointed to the chair of his science in the University (1866–91). He was awarded the Davy Medal in 1883 and became a member of the Royal Society in 1902. His name is famous for his work on thermochemistry. *Thermochemistry* (1908), an abstract of his *Thermochemische Untersuchungen* (1882–86). He also made accurate determinations of the atomic weights of oxygen and aluminium.

**Thomson, Sir Charles Wyville** (1830–82), zoologist, b. at Bonnysside, W. Lothian; educated at Edinburgh Univ., he became prof. of zoology at Cork, at Belfast and, from 1870, at Edinburgh. He is chiefly remembered as director of the scientific staff in the *Challenger Expedition* (1872–76). Knighted in 1876. He wrote *The Depths of the Sea* (1872) and *The Voyage of the Challenger* (1877).

**Thomson, Elihu** (1853–1937), Anglo-Amer. electrician and inventor, b. in Manchester, and moved to the U.S.A. with his parents while a child. He was educated at the Central High School in Philadelphia. From 1875 to 1880 he was prof. of mechanics and chemistry at this institution. From 1880 he was chief electrician for the Thomson-Houston Co. and the General Electric Company, which under his inventions operate more than 600 patents. Besides numerous inventions in electric lighting and dynamo making, he was the discoverer of the method of electrical welding. He was the first to utilize a magnetic field to move an electric arc, made the first high frequency dynamo, invented the electric watt-hour meter, and was the first to make stereoscopic X-ray pictures. He was presented with medals by most of the great societies of the world, among them the Rumford medal in 1902, the Hughes medal of the Royal Society in 1916, the Kelvin medal in 1924, the

Franklin medal in 1925, and the Faraday medal, 1927. He was an hon. member of the Royal Institution.

**Thomson, Sir George Paget** (b. 1892), British physicist; b. at Cambridge, the son of Sir J. J. Thomson, the discoverer of the electron. Elected a fellow of Corpus Christi College, Cambridge, in 1914, he served in France 1914-15, and worked on aerodynamical problems from then until 1919, when he returned to Cambridge. From 1922 to 1930 he held the chair of Natural Philosophy at Aberdeen, and since 1930 has been prof. of physics at the Imperial College of Science and Technology, London.

De Broglie's view that electrons possess not merely the properties of discrete particles but also have many of the attributes of wave motion was strongly supported by experiments performed by T., who in 1937 and 1939 respectively was awarded the Nobel Prize for physics, and the Hughes Medal of the Royal Society. He was a member of the Aeronautical Research Committee 1937-41, and in 1943-44 acted as scientific adviser to the Air Ministry. From 1946-47 T. was scientific adviser to the Brit. delegation to the Atomic Energy Commission of the United Nations. His pubs. include *Applied Aerodynamics* (1919); *Wave Mechanics of the Free Electron* (1930); *The Atom* (1937); and *The Theory and Practice of Electron Diffraction* (1939).

**Thomson, James** (1700-48). Scottish poet, b. at Edinm in Roxburghshire, was educated at Edinburgh Univ., where he occupied his leisure in writing great quantities of verse, of which three poems appeared in the *Edinburgh Miscellany* of 1720. He had originally some intention of entering the ministry, but he abandoned all thought of this, and in 1725 went to London to pursue a literary career. He became a tutor to Thomas Hamilton (afterwards seventh earl of Haddington), and made the acquaintance of many of the leading men of letters. His pub. u 1726 *Winter*, which was highly applauded, and thus he followed in the next year with *Summer*. *Spring* appeared in 1728, and two years later he repub. these three poems, adding to them *Autumn*, under the title of *The Seasons*. He subsequently carefully revised this work, but it was not brought out in its amended form until 1744. T. in 1730 had his play *Sophonisba* produced at Drury Lane, but in spite of its many merits it was not successful. In 1731 he accompanied the 'son of Lord Chancellor Talbot on the 'grand tour.' This inspired the poem *Liberty* (1734). *Agamemnon* (1738) was his next work, and in 1740, in collaboration with David Mallet, he wrote *The Masque of Alfred*, which is famous because therein first appeared the undying ode 'Rule Britannia.' It is virtually certain that T. was the author of 'Rule Britannia,' though Mallet's claims to it have been discussed. Since 1738 T. had been in receipt of a pension from Frederick, Prince of Wales, and in 1744 was given by Lyttelton the sinecure office of surveyor-general of the Leeward Is. His later works include the

plays *Edward and Eleonora* (1739), *Tan-*

buried in Richmond Church. When T. began to write, Eng. poetry was dominated by artificiality, and Pope was the prin. living poet; but T. introduced the true, simple, romantic treatment of nature, and his influence on his contemporaries, as on his successors was unbounded. T.'s *Works* were first collected in 1763. The Oxford Ed. of the poetical works is by J. L. Robertson (1908). See lives by R. Shiel, 1753, S. Johnson, 1781, G. C. Macaulay, 1908.

**Thomson, James** (1822-92), British physicist, was also an engineer, inventor, and geologist. He was prof. of civil engineering at Belfast (1857-73) and Glasgow (1873-89), and was the first to demonstrate the possibility of lowering the freezing-point of water, etc., by pressure.

**Thomson, Sir John Arthur** (1861-1933), Brit. naturalist, b. in E. Lothian. Educated at the Univs. of Edinburgh, Jena, and Berlin. Sometime lecturer in zoology and biology in the School of Medicine, Edinburgh, he was also Regius prof. of natural hist., Aberdeen, 1899-1920. Author of: *Study of Animal Life* (1892) (rev. 1917); *Herbert Spencer* (1906), *Darwinism and Human Life* (1910) (rev. 1916), *Biology of Birds* (1923), *Science and Religion* (1925); *Outline of Biology* (1930); *Biology for Everyman* (1934). He was knighted in 1930.

**Thomson Effect**, see ELECTRICITY, *Thermo-Electricity*

**Thomson, Sir Joseph John** (1856-1940), Brit. physicist; b. near Manchester, eldest son of J. J. Thomson. Educated at Owens College and Trinity College, Cambridge, where he was Second Wrangler and second Smith's prizeman, 1880. Lecturer at Trinity College, 1883, and Master of Trinity College and Prof. of Physics, his association with Cambridge lasted throughout his life. In 1884 he succeeded Lord Rayleigh as Cavendish Prof. of Experimental Physics (1884-1918). To T. belongs, by general consent, the credit for the discovery of the electron, following researches in which he estab. that electricity has mass. His book, *Application of Dynamics to Physics and Chemistry* (1886) was to a great extent the foundation-stone on which the study of physical chemistry was built. This was followed by numerous papers on electrical theory and experiments on gases. After Röntgen had demonstrated the existence of X-rays produced by substances struck by cathode rays, T. assisted by Rutherford then a young research student from New Zealand) adapted the discovery to his own use and used the X-rays for producing more controllable electrified gas. Through his researches in this field he proved that all matter is made of electricity and that electricity is atomic in nature. His subsequent researches into the nature of electricity resulted in the development of the study of atomic physics, in which T. as a pioneer, gained international recog-

nition from the scientific world. He was awarded the O.M. in 1912, and was president of the Royal Society from 1916 to 1920. His pubs. include: *On the Motion of Vortex Rings* (1883); *Application of Dynamics to Physics and Chemistry* (1888); *Elements of the Mathematical Theory of Electricity and Magnetism* 1895; *The Discharge of Electricity through Gases* (1898); *The Conduction of Electricity through Gases* (1903); *Corpuscular Theory of Matter* (1907); *Thermochemistry* (1915); and *The Electron in Chemistry* (1923). See life by Lord Rayleigh, 1942.

**Thomson, William**, see KELVIN, BARON.

**Thor**, god of thunder, see MYTHOLOGY.

**Thoracic Duct**, duct which conveys the greater part of the lymph and chyle into the blood. It is the common lymph trunk of the body except for the right upper extremity, right side of the head, neck, and thorax, right lung, right side of the heart, and convex side of the liver. It does not, as its name would seem to imply, lie wholly within the thoracic cavity, but begins in the abdomen, on the front of the body of the second lumbar vertebra, by a dilatation known as the *receptaculum chyli*. It reaches the thorax by passing through the aortic openings in the diaphragm, passes upwards to the root of the neck, and then takes a curved course outwards and downwards, emptying itself into the left subclavian vein at its junction with the left internal jugular vein. The duct measures, in the adult, between 15 and 20 in. in length.

**Thorax**, see CHEST.

**Thordsson, Sturla** (1214-1284), nephew of Snorri Sturlason (*q.v.*), whose *Heimskringla* he is credited with having taken to Norway in 1263. He is famed for the supplement, *Skaldatal* ('list of skalds'), which he ordered to go with *Heimskringla*. T. was himself a very distinguished skald.

**Thoreau, Henry David** (1817-62), Amer. naturalist and author, b. at Concord, Mass., of mixed Scottish and Fr. descent. T. passed through school and Harvard Univ. without gaining any distinction. The two famous years of his life were those he spent as a recluse in his self-made shanty in the woods near Walden Pond (1845-47), and it is his *Walden* (1854) which reveals his curious and arresting originality. Here he lived happily on a bare pittance, indulging to the full his sympathies with bird and beast, and giving free rein to his fresh and noble but rather egotistic thoughts. Other writings are *A Week on the Concord* (1849); *Excursions* (pub. posthumously, 1863); *The Maine Woods* (1864); *Cape Cod* (1865). The standard ed. is the Riverside 10 vols. 1891, 1895; there is also a collection (*Journal omitted*), *The Works of Thoreau*, ed. by H. S. Canby (1947). See H. A. Page, *Thoreau, his Life and Aims*, 1878; also lives by F. B. Sanborn (1882); H. S. Salt (1890); F. H. Allen (1908); J. B. Atkinson (1928); W. White; (1939); and J. W. Krutch (1948).

**Thorez, Maurice** (b. 1900), Fr. politician, b. at Noyelles Godault, l'as de Calais, son of a coal-miner. He joined the Communist party in 1920 and was its leader

from 1936 to 1939. A military tribunal condemned him in absence for avoiding military service at the outbreak of the Second World War. He spent some time in Moscow, returning in 1944 to become a member of the consultative assembly and a minister of state under de Gaulle. He held various cabinet offices until 1947 when President Auriol removed Communist ministers after they had opposed the gov. of which they were a part.

**Thorium**, metallic element, symbol Th, atomic weight 232.2, atomic number 90. T. was discovered by Berzelius in 1828, and is obtained commercially from the monazite sand of Brazil, Malay, Travancore, etc. Thorium oxide, ThO<sub>2</sub>, is extracted from the sand, and is used in the preparation of incandescent gas-mantles. Metallic T. is difficult to isolate, owing to its chemical activity, but it has been prepared pure by strongly heating thorium chloride with sodium in a vacuum. It is a greyish metal, melting at over 1800° C. When heated in air or oxygen it burns brilliantly. T. is radioactive, thorium atoms gradually disintegrating to mesothorium, thorium-x, thorium emanation, and so on, a final product which is one of the isotopes of lead. Helium is also given off.

**Thorn**, see TORUM.

**Thornaby-on-Tees**, par. and mun. bor. in the N. Riding of Yorkshire, with the co. bor. of Middlesbrough to the E. The riv. is the boundary with the mun. bor. of Stockton-on-Tees, Co. Durham. Charter of Incorporation granted 1892. Prin. industries: engineering and bridge-building, iron foundries, flour milling, sugar refining, and wire rope manuf. T.-on-T. is in the Parl. constituency of Middlesbrough W. Pop. 24,000.

**Thorn Apple**, see DATURA.

**Thornike, Dame Sybil** (Mrs. Lewis Thomas Casson), (b. 1882), Eng. actress, b. at Gainsborough, Lincs; daughter of Arthur John Webster T., hon. canon of Rochester. Educated at Rochester High School. With her brother, she joined Ben Greet's Academy, her first professional appearance being in 1904 at Cambridge. After touring with that company in America for four years, she was with Miss Horniman's Manchester Co., 1908-09. Married in 1908, she joined the Chas. Frohmann repertory, 1910, and made an Amer. tour with John Drew, 1910-11. From 1914 to 1918 she played leading rôles at the Old Vic, and at the Little Theatre from 1920 to 1922. Her creation of the title rôle in Shaw's *St. Joan* in 1924 gained her wide recognition. Her range and quality have been shown in the classical parts of Lady Macbeth, Medea, and Lady Teazle, in Peer Gynt as Aase (1944), and in *The Linden Tree* (1947). She was created D.B.E. in 1931.

**Thorne**, mkt. tn. and rural dist. on the Don, with barge-building, mining, engineering, and textile industries, in the W. Riding of Yorkshire, Eng. Pop. of rural district 33,000; area, 38,419 ac. Pop. of tn. about 15,000.

**Thornhill**: (1) suburb with woollen and shoddy mills, S. of Dewsbury, in the W.



Riding of Yorkshire, England. (2) picturesque vil. with ruins in the neighbourhood of Dumfries, Scotland. Near it are Drumlanrig Castle, seat of the duke of Buccleuch and Queensberry; and Maxwelltown House, b.p. of Annie Laurie Pop. 1200.

**Thornton**, (1) vil. 4 m. S. of Fleetwood, on the Wyre, in Lancashire, England. It is now joined with the seaside resort of Cleveleys to form the urban dist. of Thornton Cleveleys. Pop. (1931) 10,144. (2) Former vil. 4 m. W. of Bradford, Yorkshire, and b.p. of the Brontës. In 1899 it was incorporated in the City of Bradford. Agriculture is carried on, and there are wooden and worsted industries.

**Thornycroft, Sir William Hamo** (1850-1925), Eng. sculptor; b. in London; son of the sculptor, Thomas Thornycroft (1817-55). Educated at Macclesfield Grammar School and Univ. College School, London. He helped his father with the Park Lane Fountain (removed in 1948) 1872, contributing Comedy, Shakespeare, and Fame. He won R.A. gold medal, 1875. Other works 'Lot's Wife,' 1878, 'The Mower,' 1884, in Walker Art Gallery, Liverpool; statue of Cromwell in front of the Houses of Parliament, and Gordon's statue in Trafalgar Sq. He was knighted in 1917.

**Thorough-Bass** (actually the old spelling of Through-B.), system of shorthand notation used by composers during the early part of the seventeenth century and persisted until about the middle of the eighteenth.

**Thoroughbred**, see under HORSE.

**Throw-wax**, see RUPELURUM.

**Thorshavn**, cap. of the Faroe Is., is situated on the S.E. coast of Strøma. To the E. of Eystaravag are the remains of an auct. fortress, parts of which serve as prison and lighthouse. The prin. buildings are the church, the Parliament building, the governor-general's house, the library (and museum) and the theatre. In 1940 the Faroe Is. came under L.t. protection and during the war Thorshavn was a R.A.F. flying-boat base. Pop. 4000.

**Thorwaldsen, Bertel** (1770-1844), a Dan. sculptor, b. at Copenhagen, son of a poor woodcarver. He studied for a while in the school of art in his bp., and subsequently went to Italy, where he was influenced by Canova and where he remained for twenty-three years. Soon after his death a permanent exhibition of his work was formed at Copenhagen, while his statue of Byron is now at Trinity College, Cambridge. The Lion of Lucerne (see LUCERNE) is also his work. Thorwaldsen estab. an international reputation during his life-time, and examples of his monumental sculpture may be seen on buildings and in churches all over Europe. His art was dominated by classical Gk. and Rom. sculpture, and his artistic achievement is one of successful imitation and of skill rather than creative vision. See lives and studies by J. M. Thiele, 1852-56; A. Rosenberg (2nd ed.), 1901; and E. E. Douglas, 1933.

**Thospia**, see under VAN.

**Thoth**, Egyptian deity, resembling the Gk. god Hermes, and later identified with Hermes Trismegistus. He was the god of magic, science, and invention, and taught man how to write and calculate. He is represented with the head of an ibis, this bird being sacred to him.

**Thothmes, Tethmosis, or Tehutmes**, name of four kings of auct. Egypt, who belong to the eighteenth dynasty; *Thothmes I.* (c. 1540 B.C.) finally subdued and enlarged Cush or Nubia, fixed the boundary of his kingdom at the fourth cataract, and made successful campaigns as far as the Euphrates. He enlarged the Theban temple of Ammon or Amen at Karnak (*q.v.*), which gradually became the largest temple in the world. He was the first king to be interred in the valley of the tombs of the kings at Thebes. *Thothmes II.*, his son, reigned less than three years. *Thothmes III.*, the son of Thothmes II., did little till the death of his stepmother and aunt, the despotic Queen Hatshepsut. He fought successful campaigns in Libya, Ethiopia, and the revolted Syria, secured the Phœnician ports, and received ann. tribute from Crete, Cyprus, and the Aegean Isles. He built an enormous number of temples, his greatest work being the colonnade at Karnak, and set up sev. magnificent obelisks. His conquests enriched the country, and he proved an efficient administrator. He d. at a very advanced age. *Thothmes IV.* was a grandson of Thothmes III., and ruled till about 1400.

**Thouars**, tn. in the dept. of Deux-Sèvres, France, on the R. Thouet. Parts of the mediæval walls are standing, and there are old churches and a castle. There is an active trade in grain, wine, oil, etc. Pop. 10,400.

**Thought Reading**, see PSYCHICAL RESEARCH; TELEPATHY.

**Thourout**, tn. of Belgium, in the prov. of W. Flanders. It holds large horse fairs and produces leather, cloth, chicory, etc. Pop. 10,578.

**Thousand and One Nights**, see ARABIAN NIGHTS.

**Thracia**, or **Thrace**, was in earlier times the name of the vast space of country bounded on the N. by the Danube, on the S. by the Propontis and the Aegean, on the E. by the Pontus Euxinus, and on the W. by the R. Strymon and the easternmost of the Illyrian tribes. It was divided into two parts by Mt. Hæmus (the *Balkan*), running from W. to E., and separating the plain of the lower Danube from the rivs. which fall into the Aegean. At a later time the name *Thrace* was applied to a more limited extent of country. *Thrace*, in its widest extent, was peopled in the times of Herodotus and Thucydides by a vast number of different tribes. The earliest Gk. poets, Orpheus, Linus, Musæus, and others, are all represented as coming from *Thrace*. The Thracian Chersonesus was probably colonised by the Gks. at an early period, but it did not contain any important Gk. settlement till the migration of the first Miltiades to the country, during the reign of Pisistratus. The first really historical

fact respecting the Thracians is their subjugation by Megabazus, the general of Darius. After the Persians had been driven out of Europe by the Gks., the Thracians recovered their independence; and at the beginning of the Peloponnesian war almost all the Thracian tribes were united under the dominion of Sitalkes, king of the Odrysæ, whose kingdom extended from Abdera to the Euxine and the mouth of the Danube. Sitalkes fell in battle against the Triballi in 424, and was succeeded by his nephew Seuthes, who raised his kingdom to a height of power and prosperity which it had never previously attained. Philip, the father of Alexander the Great, reduced the greater part of Thrace; and after the death of Alexander the country fell to the share of Lysimachus. It subsequently formed a part of the Macedonian dominions. T. was the centre of disturbances in more modern times. It was one of the theatres of war in the Balkan war of 1912, when the Bulgarians entered it and defeated the Turks. With the help of the Serbs Bulgaria took Adrianople, and nearly all T. was given to Bulgaria by the treaty of London signed in 1913. However, quarrels with her allies about the div. of the conquered terrs. led to the second Balkan War in 1913, when the Turks recaptured Adrianople and re-occupied Thrace. The treaty of Sept. 1913 gave Bulgaria her outlet to the Aegean Sea through Thrace. In 1919, after the First World War, the boundary was again changed, and the sea coast given to Greece, which obtained most of Thrace by 1920. In 1923, the treaty of Lausanne provided for the giving up to Turkey of E. Thrace as far as the Maritza, and W. Thrace, except Karagach, was given to Greece. Thrace in Greece has an area of 3,315 sq. m., and is divided into two prefectures—*Ileevros* (pop. 153,000), and *Rhodope* (pop. 201,800), total pop. (1940) 351,800. *Alexandroupolis* (17,800) and *Komotini* (32,900) are the respective caps. of the two prefectures. E. Thrace, or Turkey-in-Europe has an area of 9,256 sq. m. and a pop. (1945) of 1,497,000. It includes the cities of Istanbul and Edirne. Gk. Thrace was occupied by Gers. and Bulgarians in 1941 and annexed to Bulgaria until the 1944 armistice. During this period attempts were made to give the area a Bulgar character, these activities contributing to much unrest during the Gk. civil war which began in 1946. See W. Tomaschek, *Die Allen Thraker*, 1893; 94; A. J. Toynbee and others, *The Balkans*, 1915; F. Schevil, *The Balkan Peninsula*, 1922; *Treaty of Peace with Turkey*, signed at Lausanne, July 24th, 1923, 1923; *Cambridge Ancient History*, vol. 8, 1930.

**Thracio-Illyrian Languages**, see under INDO-EUROPEAN LANGUAGES.

**Thrale, Henry** (1728–81), Eng. brewer, famous as the host of Dr. Johnson. He inherited his father's brewery in 1758 and, in 1763, married Hester Lynch Salusbury, 'of good Welch extraction, a lady of lively talents, improved by education' (Boswell). T. and his wife were lifelong

hosts of Dr. Johnson at their home at Streatham Park. Three years after T.'s death, Mrs. T. married Gabriel Piozzi, a musician (see also PIOZZI, HESTER LYNCH).

**Thrale, Hester Lynch**, see PIOZZI.

**Thrasæ, P. Pæstus** (d. A.D. 66), Rom. senator and Stoic philosopher in the reign of Nero, a native of Patavium. He made the younger Cato his model, of whose life he wrote an account. After incurring the hatred of Nero, he took his life by command of the emperor.

**Thrashing, or Threshing**, separation of the grain from the straw, or the seed from the haulm. Formerly the operation was performed by the flail, and this laborious but effective implement is still occasionally used by seed growers and on small holdings. The first workable threshing machine was invented by Andrew Meikle about 1786; the modern machine, besides effectively sorting out the products of the sheaf, delivers the straw unbroken and ready for trussing. The machine was at first worked by hand, then by portable steam engines which were drawn from farm to farm by horses until they were superseded by self-propelled steam engines. These, in turn, were followed by tractors, those with Diesel engines appearing to be the most suitable. Water power and even horse gears are occasionally employed, more especially with fixed machines. The corn is passed by hand or self-feeder into the drum mouth and is threshed out by beaters. The straw is passed out, after the grain has been shaken away, by means of riddles, an air blast from a fan, and rotary screens which grade the corn. The most common of the threshing machine's auxiliaries are the chaff cutter, for cutting oats or barley straw into short lengths for cattle feed; the straw tier, which produces bundles or trusses of straw for thatching etc.; the straw baler, which compresses the straw into wire-bound bales; and the huller, which is used for threshing very small seeds. The combine harvester cuts and threshes in one operation and has threshing mechanism similar to that of a stationary threshing machine. However, it is not always possible to produce clean grain because of the quantities of green weeds cut close to the ground which tend to clog the sieves in the machinery, and thus small pieces become included in the threshed grain; for this reason it may be necessary to pass the grain through a separate dressing machine. Since the grain is cut and threshed at the same time, and has no opportunity to dry naturally in the traves and stack (see REAPING), the moisture content may remain high. Unless the grain is then dried artificially in plant installed in the farm buildings for that purpose, it may heat or ferment when stored. The straw left by the combine tends to be much broken, but if wanted for litter or fodder, it can be collected by a pick-up baler or swept up to a stationary baler or stack. Otherwise it is left to be ploughed in or burnt.

**Thrasimene**, see THRASIMENE LAKE.

**Thread**, fine cord made by twisting the fibres of such substances as cotton, wool,

silk, and flax. The slightly twisted yarns used for weaving are strictly called Ts., but the term is more commonly applied to the stronger and more highly finished cords used for sewing, etc. The cotton or other material is first twisted into yarn, which is doubled upon itself and twisted in the opposite direction to the original twist. The product is then two-ply thread. To make a stronger thread, e.g., six-cord T., a number of two-ply yarns are twisted by the winding machine again in the opposite direction to the previous twist.

**Thread** (of sorews), *see under* SCREWS, BOLTS, AND NUTS.

**Thread Cells, Stinging Cells, or Cnidoblasts**, occur in Coelenterates as cells with bulb-shaped structures (nematocysts) containing fluid and having the narrower end prolonged into a fine tube folded inwards in the cavity of the bulb as a spiral coil. Externally the cell bears a conical projection (cnidocil), and when a small animal comes in contact with this the fine tube turns inside out and is shot into the animal's body, becoming fixed by barbs at the base of the tube while poison passes through it. They are the stings of the jelly fish and are also well developed in the 'Portuguese Man-of-War' (Physalia).

**Threadneedle Street**, busy thoroughfare running W. from Bishopsgate to the Bank of England in the City of London. It received its name from the Merchant Taylors' Company. The Bank of England is sometimes called familiarly 'The Old Lady of Threadneedle Street.'

**Thread-worms**, *see* NEMATODES.

**Threats**. It is a felony either (a) *verbally* to accuse or threaten to accuse another of any infamous crime (e.g. murder, rape) with a view to extorting from the person so accused or threatened or from any other person any property, money, or valuable security, or (b) to send a letter containing T. to accuse another person of crime with intent to extort something of value; and so grave does the law regard this offence that a conviction may involve a sentence of imprisonment for life. The guilt or innocence of the recipient is material only in considering whether the intention of the prisoner was to extort money by his T., or merely to compound a felony (*see under* COMPOUNDING). Similarly it is a felony punishable with imprisonment for any term up to life to send a letter demanding with T. and *without reasonable cause* any money or other property. Sending a letter containing T. to murder a person, or to burn or destroy his house, or to maim his cattle, are all felonies punishable with ten years' imprisonment.

**Three Choirs Festival**, Eng. music festival estab. in 1724. It is held annually, in Sept., successively in the cathedrals of Hereford, Gloucester, and Worcester. New works from eminent contemporary composers have always been a feature of the T. C. F., the works of Parry and Elgar having especially being promoted there.

**Three-Colour Process**, *see under* PROCESS WORK.

**Three Kings, Feast of**, *see* TWELFTH DAY.

**Three Mile Limit**, *see* TERRITORIAL WATERS.

**Three Rivers**. (1) tn. of Michigan, U.S.A. with mineral springs and light car factories, on the St. Joseph R. Pop. 6700. (2) in Quebec, *see* TROIS RIVIERES.

**Threnody** (Gk. *thēnos*, *thēnos*, wailing and *ōdē*, ode), song of lamentation, especially on a person's death. Gaelic literature supplies examples in the typical 'keens,' as e.g. the 'Keen on Art O'Leary,' originally pub. in Mrs. Morgan J. O'Connell's *The Last Colonel of the Irish Brigade* (1892). The true example of the spontaneous keen is in short broken lines, containing in quick, natural succession, appeals, reminiscences, laments, and moves backwards and forwards as the irregular promptings of grief and affection dictate without form or premeditation. *See also* DIRGE; GAELIC LANGUAGE AND LITERATURE.

**Threshing**, *see* THRASHING.

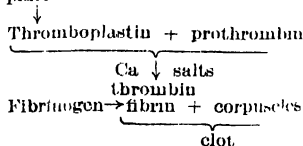
**Thresher**, *see* FOX-SHARK.

**Thrift, or Sea Pink** (*Armeria vulgaris*), summer-flowering perennial plant of the family *Plumbaginaceae*. It has slender stiff grass-like leaves growing in bundles from the woody branches of the root-stock. The soft funnel-shaped rosy flower heads rise on hairy slender stems from the tufts of leaves. T. grows wild on cliffs and rocks in seaside places, and also in int. dists.

**Throat**, the front of the neck; or the upper part of the respiratory passages in the neck. *See* PHARYNX, LARYNX, QUINSEY, SORE THROAT, etc.

**Thrombin**; enzyme (organic catalyst), which brings about the clotting of blood by catalysing (speeding up) the conversion of *fibrinogen*, present in the blood plasma, into *fibrin*. The latter substance, as its name implies, is deposited as a fibrous network in which the corpuscles of the blood become entangled, the whole mass constituting the clot, whereby further loss of blood is prevented. Since blood does not normally clot whilst still circulating in the vessels, it is thought that T. is not present as such but in the form of its precursor, *prothrombin*. The damaged tissues of blood platelets at the site of a wound liberate *thromboplastin* which, under the influence of calcium salts, combines with *prothrombin* to form T.

Damaged tissues and platelets



The blood-sucking leeches are able to produce *hirudin*, which combines with *prothrombin* and hence prevents clotting. The clotting mechanism is disturbed in the conditions of (1) *thrombosis*, when it takes place in the vessels, and (2) *hæmo-*

*philia*, an inherited disease in which the blood continues to escape for a long period even from a small wound.

**Thrombosis and Embolism**, formation of a plug by the coagulation of blood or by depositions from it, and results from injury to the endothelial cells lining the walls of the vascular system. The clots are deposited on the injured wall, and serve as nuclei for further deposits. They obstruct the circulation, and may even completely close the lumen of the blood-vessel. Since blood flows more slowly through the veins, venous thrombosis is more common than arterial thrombosis. The extent of the injury caused by thrombosis depends on the size, situation, and condition of the thrombus. In a main vessel, the blockage may be fatal; in smaller vessels it usually results in the necrosis of the surrounding tissues. Septic thrombi cause local abscesses, and may give rise to empyema. Frequently by the movement of the blood or by disturbing body movements the thrombus, or pieces of it become detached, forming emboli, and the carriage of these in the blood-stream is termed embolism. Embolism may also be due to the occlusion of air, usually resulting from the exposure of a wound. Emboli of fat may be formed by the escape of fat from bone marrow when bone is badly fractured. Emboli may block the circulation at a point far removed from the situation of the thrombus, and, when septic, cause abscesses and empyema. An embolus blocking the pulmonary artery will cause sudden death, but in arteries with numerous branches comparatively little interference with circulation is caused by the obstruction of one branch. Obstruction of vessels at some distance from the heart may result in gangrene (*q.v.*).

**Throndhjem**, see TRONDHJEM.

**Thrush**, species of inflammation of the mouth due to a particular fungus known as *Oidium albicans* or *Saccharomyces albicans*, and characterised by diffuse white patches. It generally occurs in feeble children, but adults, prostrated by wasting diseases, may also be affected by it. It is also a disease which affects the frog of a horse's foot.

**Thrush** (*Turdidae*), family of passerine birds of very extensive distribution and of omnivorous diet. The typical genus *Turdus* includes sev. Brit. species, such as the blackbird, the ring ouzel, redwing, and fieldfare, to which the name T. is not commonly applied. The song T. (*q.v.*), thrush, or mavis, is one of the best-known Brit. song-birds. The nussel T. or holm T. (*T. viscivorus*) is a larger bird with a slightly forked tail. It sings before and during storms.

**Thucydides** (c. 464 c. 404 B.C.), Gk. historian, the son of Olorus, or Orolus, and Hegesippyle, was a native of Attica. He is said to have been instructed in oratory by Antiphon, and in philosophy by Anaxagoras. He possessed gold mines in that part of Thrace which is opposite to the is. of Thasos, and here he was a person of the greatest influence. He commanded an Athenian squadron of seven ships at

Thasos (424), but failing in his attempt to save Amphipolis, he became an exile, probably to avoid a worse punishment. He spent twenty years in exile (v. 26), returning in 404 B.C., when a general amnesty was granted on the restoration of the democracy by Thrasybulus. According to some accounts, he was assassinated at Athens soon after his return; according to others, he d. at Thasos, and his bones were carried to Athens. At all events, his death cannot be placed later than 401.

The Peloponnesian war forms the subject of the hist. of T. Though he was engaged in collecting materials during the whole of the war, he does not appear to have reduced them into the form of a hist. until after his return from exile, since he alludes in many parts of it to the conclusion of the war (i. 13; v. 26). He did not, however, live to complete it: the eighth book ends abruptly in the middle of the year 411 B.C., seven years before the termination of the war. The object of the hist. was to give such a faithful representation of the past as would serve as a guide for the future (i. 22). His observation of human character was profound, and his painstaking accuracy and careful attention to chronology are remarkable. His strict impartiality is another feature of his work. His style is marked by great strength and energy, but he is often obscure, particularly in the speeches. J. M. Stahl's ed. of T. was pub. 1866-82, 1873-74. The Oxford text ed. by H. Stuart Jones was pub. 1898-1900. Jowett's trans. of *The Peloponnesian War* with analysis and notes appeared in 1881. A trans. by C. F. Smith is in the Loeb Library, and R. Crawley's trans. (1876) is reprinted in Everyman's Library. See G. B. Grundy, *Thucydides and the History of his Age*, 1911 (revised ed., with vol. ii, 1948), C. N. Cochrane, *Thucydides and the Science of History*, 1929; and A. W. Gomme, *A Historical Commentary on Thucydides*, 1945; also J. B. Bury's *Ancient Greek Historians*, 1909, and Sir R. C. Jebb's essay on the speeches of T. in *Hellenica*, 1880.

**Thucydides**, Athenian statesman who led the aristocratic party in opposition to Pericles. He was ostracised in 444 B.C.

**Thugs**, roving bands of fanatical murderers and robbers who used to infest parts of Central and N. India. Thuggery, as their system was called, had a religious basis, the murdered persons and a certain part of their belongings being regarded by the T. as sacrifices to the goddess Kali. The systematic suppression of the T. was begun about 1830 by Capt. W. H. Sleeman, Bengal Army (afterwards Major-Gen. Sir William Sleeman), and continued for many years afterwards; indeed the department for the suppression of Thagi and Dakaiti only came to an end in the present century.

**Thujam** see ARBOR VITAE.

**Thule**, (1) name generally given by the ancients to the most northerly part of Europe known to them. According to Pliny, it was an is. in the N. ocean, dis-

covered by the navigator Pytheas of Massilia, who reached it after six days' sail from the Orcaades. Müllenhoff plausibly identifies it with the Shetlands. Procopius and others use it to denote Scandinavia. The name T. appears to be merely a classic form of the Gothic *Tiel* or *Thiule*, 'remotest land.' The phrase 'ultima Thule' is commonly used to describe any far-away unknown region. (2) In Greenland, a Dan. possession, the most northerly settlement in the world. It has a hospital. Pop. 300. See also RASMUSSEN. See K. Rasmussen, *Greenland by the Polar Sea* (trans.), 1921, and A. Gilberg, *Eskimo Doctor* (trans.), 1948.

**Thulium**, metallic chemical element, symbol *Tm*, atomic weight 169.4, atomic number 69, belonging to the rare-earth group (*q.v.*). It was discovered in 1879 by (Cleve, but was first prepared pure by James in 1911. Its salts are pale green in colour. T. is extracted from the minerals gadolinite, euxenite, etc.

**Thulla**, see ADULE.

**Thumbscrew**, iron instrument of torture for compressing or breaking the thumbs. It was used by the Sp. Inquisition and in the persecutions of the Covenanters in Scotland, where its last recorded use was towards the end of the seventeenth century.

**Thun:** (1) Lake of canton Bern, Switzerland, traversed by R. Aar, and also receiving the Simme. Length 10½ m.; average width, 2 m.; greatest depth, 700 ft.; altitude 1840 ft. (2) Tn. of canton Bern, on lt. Aar, 1 m. below its exit from above lake. A trade centre, and has slate and brick works. Pop. 20,000.

**Thunder**, see LIGHTNING and THUNDERSTORMS.

**Thunderer**, *Thē*, see 'TIMES, THE.'

**Thunderbolt**, or **Thunderstone**, common name for objects once erroneously thought to have been formed by thunder and lightning, the belief being that thunder somehow sent forth a destructive bolt or dart (*cf.* Jupiter's levin bolts in *cl.* mythology). A so-called thunderbolt is really a discharge of lightning from one part of the sky to another, and especially one to earth which does damage. Lightning in certain cases does leave behind it a vitrified tube, called a fulgurite (*see* FULGURITES), which, however, is not flung or darted, but is created by vitrification or fusing on the spot where it is found. The term thunderstone is used especially for objects having more or less a dart or arrow shape, for bleminites, for meteorites (*q.v.*), and the pyritous nodules to be found in cretaceous rocks. The thunderbolt myth recurs in many lands; but the Sioux 'among their varied fancies about thunder-birds (an imaginary bird in the mythology of races of low culture, and personifying thunder) and the like, give unusually well a key to the myth. They consider the lightning entering the ground to scatter there in all directions *thunder-bolt stones*, which are flints, etc., their reason for this notion being the very natural one, that these siliceous stones actually produce a flash when struck.' (Tylor, *Primitive Culture*.) In the traditions of

the Finns concerning purification by fire, it became expedient to find a substitute and hence the healing virtues of the thunderbolt were embodied in the *Keraunio* or thunderstones. The 'holy stones' of the A.-S., or 'holed stones,' arrow heads, flint knives and the like worked by prehistoric men, were popularly believed to be stones which, falling down from heaven possessed heavenly virtues, and were of use in all sorts of diseases.

**Thunderstorm**, rain, snow or hailstorm with thunder and lightning. Lightning is an electrical discharge which causes rapid expansion and contraction of the air producing the sound of thunder. Lightning travels at 186,000 m. per sec., the speed of light, but thunder only at 1100 ft. per sec. so that, although both occur simultaneously, thunder is heard some time later, 5 sec. for every mile away. Since different parts of the lightning flash are at different distances and heights, and the speed of sound decreases with height, the thunder is not normally heard as a single crack but as a succession of rolling sounds. As a rule thunder can only be heard at distances up to 10 m. but this varies with the conditions and thunder has on occasion been heard up to 300 sec. after the lightning flash—from 60 m. away.

Observations in America by a close network of ground stations and specially equipped lighter aircraft have shown that a T. consists of several convective cells each up to 5 m. in diameter starting with an up current extending up to more than 20,000 ft. often attaining more than 60 m.p.h. As this air rises its temp. soon falls to the dew point and below, and water droplets are condensed out forming cloud and eventually raindrops in great quantities. The maximum raindrop size is 5.5 mm. diameter with a maximum falling velocity through the air of 18 m.p.h.; after any further growth the raindrops are deformed and broken (*see* RAIN AND RAINFALL); so that they are carried up into the top parts of the cloud. From there, and even lower levels if the up current is slanting, the rain can fall into surrounding, initially drier, air into which it begins to evaporate. This air then becomes colder and heavier than its surroundings and generates a down current which appears at the surface as a cold gust or squall. Although much of the rain is evaporated in maintaining saturation of the down current most reaches the surface and the heaviest rainfall is observed in this region of cold air. When the down current reaches the surface it must spread out and can extend as much as 12 m. in advance of the T. It acts as a cold wedge and may give the initial up thrust to start new convection cells of the T. Eventually the up current in the older convection cell fades from the base upwards and the whole cell then consists of a down current before dying away completely.

Sir George Simpson's theory of the lightning that accompanies the storm attributes the origin of the formation of enormous charges of electricity to the breaking up of the raindrops. When a

raindrop breaks up the air in its vicinity becomes negatively charged, while the raindrop receives an equal positive charge. The negatively charged air rises more quickly than the drops, thus separating the charges which continues until at last the potential difference between the negatively charged layers and the positively charged drops, or between the drops and the ground attains the order of a million volts, when the insulation of the air breaks down and the discharge takes place.

**Thurber, James Groves** (b. 1894), Amer. cartoonist and humorous writer, b. in Ohio. In 1926, joined the staff of the *New Yorker*. His writings are illustrated by his own characteristic drawings and include: *Is Sex Necessary?* (with E. B. White), a satire on pseudo-scientific sex literature and *The Owl in the Attic and Other Perplexities* (1931); *The Seal in the Bedroom and Other Predicaments* (1932); *My Life and Hard Times* (1933); *The Middle Aged Man on the Flying Trapeze* (1935), satirising Falkner; *Let Your Mind Alone* (1936), satirising popularly-written works on psychoanalysis; *The Last Flower* (1939), an ironic allegory of modern war; and *The Male Animal* (with Elliott Nugent, 1940), a comedy.

**Thurgau** (Fr. *Thurgovie*), canton of N.E. Switzerland, having Lake Constance and the Rhine to the N. and N.E. Area 386 sq. m. It is watered by the Thur, Sitter, and Murg. Embroidery, spinning, and weaving are the chief industries. Cap. Frauenfeld. Pop. 138,000.

**Thurifer** (Lat. *thus*, incense, *fero*, I bear), that attendant or acolyte who bears the incense at services.

**Thurii**, more rarely **Thurium** (*Terra Nuova*), Gk. city in Lucania, founded in 443 B.C. near the site of the an. t. Sybaris. It was built by the remains of the pop. of Sybaris, assisted by colonists from all parts of Greece. Among these colonists were the historian Herodotus and the orator Lysias. The new city rapidly became one of the most important Gk. tns. in the S. of Italy.

**Thuringia**, name applied to a region of Central Germany, including the former minor states of Saxe-Weimar, Saxe-Coburg-Gotha, Saxe-Meiningen, Saxe-Altenburg, Schwarzburg-Rudolstadt, Schwarzburg-Sonderhausen, and two Reuss principalities. In April 1919 the two Reuss principalities merged into the one People's State of Reuss, and the Coburg state elected to merge with Bavaria. In the same year the seven Thuringian states combined into one, but in 1922 they divided into ten tn. and fifteen country dists. and one sub-dist. The tn. dists. were: Gera, Jena, Weimar, Gotha, Eisenach, Altenburg, Greiz, Apolda, Arnstadt, and Zella-Mehlis; the country dists., Stadtroda, Weimar, Eisenach, Meiningen, Hildburghausen, Sonneberg, Schleiz, Greiz, Altenburg, Gera, Saalfeld, Rudolstadt, Arnstadt, Gotha, Sonderhausen, and the sub-dist. of Camburg. T. became a land of the Russian occupation zone after 1945. The total area is 6099 sq. m. and the pop. 2,927,400. The Thuringian

Forest is a mt. range extending N.W. from the Frankenwald for 50 m. to the Werra, culminating in the Beerberg (3225 ft.), and the Schneekopf (3205 ft.).

**Thurles**, par. and mkt. tn. of Tipperary, Eire, on the Suir. It is on the main Dublin-Cork road and rail routes. There are turf-bogs and coal-mines near by, and there is a sugar-beet factory. Pop. 6000.

**Thurloe, John** (1616-68), Eng. politician, was appointed secretary to the Council of State in 1652, in which capacity he revealed remarkable adroitness in unmasking the intrigues of the enemies of the administration. He sat in Parliament (1654-56), and in Cromwell's second council (1657), and was appointed governor of the Charterhouse (1657), and chancellor of Glasgow Univ. (1658). He opposed the Restoration, but was acquitted on a charge of high treason (1660), and subsequently wrote sev. papers on foreign affairs for the information of Clarendon.

**Thurlow, Edward**, first Baron (1732-1806), Eng. lawyer, b. at Bracon-Ash, Norfolk, son of a clergyman. Educated at Canterbury Grammar School and at Caius College, Cambridge, he was sent down for insubordination in 1751 without a degree. Called to the Bar, 1754, he distinguished himself at an early age in his legal career, taking silk in 1762. In 1768 he was returned to Parliament for Tavistock in the Tory interest, and his speech in the same year in the Douglas Peerage case greatly enhanced his reputation. As a zealous supporter of Lord North he became solicitor-general in 1770 and attorney-general the following year, supporting the gov.'s stand against the rights of juries in cases of libel and the liberty of the press. He won over George III by upholding his Amer. policy and sharing the king's hostility towards the N. Amer. colonies. In 1778 he became Lord Chancellor and Baron Thurlow, and while retaining office under the Rockingham Gov. he opposed all its measures in a spirit of violent factionousness and always in opposition for the king who was virtually his own Prime Minister and foreign minister. Under Fox and North, however, he was forced to resign, but returned to the Woolsack under Pitt when he once more began to undermine the influence of his colleagues. Eventually, when he openly attacked Pitt's National Debt Redemption Scheme, Pitt intimated to the king that either he or T. must go, and the king at length agreed to T.'s removal (1792). T. was a master of mordant wit, profane, vulgar, overbearing, and immoral, but 'no man, said Fox, 'was so wise as Thurlow looked,' a gibe excited by T.'s physical appearance—harsh dignified features, piercing eyes under shaggy eyebrows. He was the patron of Dr. Johnson and of George Crabbe, and it is said that he was the first to discern the legal talent of Eldon. See J. C. Campbell, *Lives of the Chancellors*, 1845-69, and E. Foss, *Judges of England*, 1848-64.

**Thurn and Taxis**, Princes of, succession of princes who ruled over an immense

stretch of land in Central Europe. The most famous of them, Count Matthias, commanded the Bohemian forces at the time of the dispute over the Bohemian succession, and later served Denmark and Sweden, being finally imprisoned and released by Wallenstein. The Princes of Thurn and Taxis claimed an hereditary right over the administration of postal affairs in Central Europe, they having estab. posts as early as 1460. The last vestige of those rights disappeared in 1868 with their purchase by the N. Ger. Federation. See J. B. Mehler, *Das fürstliche Haus Thurn und Taxis*, 1899.

**Thurrock**, urb. dist. of Essex, created in 1936, by the amalgamation of the former urb. dists. of Grays, Thurrock, Tilbury, and Purfleet, and the rural dist. of Orsett, is one of the largest urb. dists. in England. Industries carried on in the area include oil refining and storage, manuf. of boots and shoes, cement, paper, margarine, and soap. At Tilbury are extensive docks and ship repairing workshops, and close by is Tilbury Fort, estab. by King Henry VIII. In Hangman's Wood, Little Thurrock, are a celebrated group of dene holes. A passenger and car ferry connects Tilbury with Gravesend on the S. bank of the Thames. Pop. (estimated, 70,000).

**Thursday**, fifth day of the week. It is named after Thor, the Scandinavian God of Thunder. In the Rom. calendar the fifth day was Jupiter's Day, *dies Jovis*.

**Thursley** (from Thors-lee, the name of a pagan god of pre-Christian times), vil. of Surrey, England, near Highbury. It has a picturesque common and an old par. church which is partly Saxon. Iron was formerly worked in the vicinity. Pop. about 500.

**Thurso**, seaport and markt. tn. of Caithness, Scotland, on Thurso Bay. It was formerly a trading centre with Scandinavia, and now exports Caithness flagstones. Harold's tower, over the grave of Earl Harold, once owner of Caithness and the Orkneys and Shetlands, is near T. Castle, home of a branch of the Sinclairs. T. was once the centre of Norse power on the mainland when at its zenith in the early eleventh century and afterwards until the battle of Largs. The main industry is fishing, and it is also a holiday resort. Pop. 3,200.

**Thyatira**, see AKHISAR.

**Thylacine**, or **Tasmanian wolf** (*Thylacinus cynocephalus*), pouched mammal of Tasmania, somewhat resembling a wolf. The fur, however, is close and short, and the tail long and tapering; its fur is grey-brown and striped with black.

**Thyme**, or **Thymus**, genus of small prostrate aromatic plants (family Labiatae), with rose-coloured, white, or heliotrope flowers. The two Brit. species are *T. chamaedrys* and the mt. T. (*T. serpyllum*), of which the lemon-scented T. of gardens is a variety. The T. used for seasoning and flavouring is *T. vulgaris*, a native of S. Europe.

**Thymus Gland**, temporary organ lodged partly in the anterior superior mediastinum, partly in the neck. It attains its

full development at about the end of the second year of life, after which it gradually atrophies, and at puberty has almost entirely disappeared. Its function is uncertain. A persistent T. G. in the adult has been considered (probably incorrectly) to be responsible for the condition of *status lymphaticus*, when death may follow any sudden exertion or shock. Recently the T. G. has been removed in the treatment of *myasthenia gravis*. See further under DUCTLESS GLANDS.

**Thyroid Gland** (*thyros* shield, *eidos* form), one of the so-called ductless glands consisting of two lateral lobes, conical in shape, connected at about their lower thirds by an isthmus which passes transversely across the trachea. A third lobe called the pyramid sometimes arises from the upper part of the isthmus or from one of the lobes, generally on the left side, and ascends to the level of the hyoid bone. Occasionally this lobe is found to be detached. Structurally, it consists of follicles lined with epithelium, producing a peculiar yellowish, glue-like substance known as colloid. Its function is the production of the hormone thyroxine, which controls metabolism and mental activity. In amphibibia thyroxine causes metamorphosis, e.g. of the tadpole into the frog. Enlargement of the gland, which may be due to hypertrophy of any of its constituent parts, is called goitre, and is occasionally associated with a disease known as exophthalmic goitre, in which the eyeballs protrude. Cretinism or myxedema results when the secretion of the gland is deficient, and can be treated by preparations of T. G. of animals. See DUCTLESS GLANDS; THYROIDIA.

**Thyrsus** (Gk. *thyrsos*), wand carried by Dionysus and the Bacchantes when taking part in his orgiastic rites.

**Thysanura**, or **Bristle Tails**, order of wingless insects, with long, many-jointed feelers and small paired limbs on several of the abdominal segments. They occur under stones or in damp earth, and often in human dwellings, one especially favouring bakers' ovens. One of the best known is the 'silver fish' (*Lepisma saccharina*) often found among papers in drawers and cupboards.

**Thyssen**, Fritz (b. 1873), Ger. industrialist, b. at Mülheim, Ruhr, son of August T. (1842-1926), one of the founders of the Ger. steel industry. His father left him a 26 per cent interest in the vast Vereinigte Stahlwerke, or Ger. steel cartel, and he became its chairman of directors after 1926, with control of great iron and steel manufacturing plants. He had always been a nationalist and during the Fr. occupation of the Ruhr in 1923 he was court-martialled and imprisoned. He was among the first Ger. industrialists to aid Hitler's rise to power, and after Hitler became chancellor, T. was rewarded by the reorganisation of his virtually bankrupt company at the expense of the Reich, becoming, in effect, economic dictator of the Ruhr industrial region, and also a member of the Prussian Council of State. He was also a member of the central com-

mittee of the Reichsbank and of the Reichstag. From 1936, however, he began to disagree with Hitler's policies and at the outbreak of war in Sept. 1939 he fled to Zurich. The Reich Gov. confiscated all his property in the following Dec. He wrote *I Paid Hitler* (1941).

**Tian Shan**, see TIENSHAN.

**Tiara**, papal triple crown, symbol of sovereign power, not sacred like the mitre. It is a high cap of gold cloth, encircled by three coronets and surmounted by a gold cross.

**Tiber** (Lat. *Tiberis*, It. *Tevere*), chief riv. in Central Italy, on which stands the city of Rome. It rises in two streams issuing from the Apennines near Tifernum, on the E. frontier of Tuscany, and flows S.W., dividing Etruria from Umbria. After flowing 110 m., it receives the Nera, and from its union with this riv. is navigable. Three m. above Rome it receives the Teverone, and within the walls of the city it is about 300 ft. wide and from 12 ft. to 18 ft. deep. The T. empties into the sea by two arms, enclosing a dismal morass, once known as the Sacred Isle or Isle of Venus. Length 245 m.

**Tiberias**. Tn. in Palestine. The auct. city lay on the W. shore of the Sea of Galilee. Herod Antipas founded a new city c. A.D. 26, and called it T. in honour of the Emperor Tiberius, his benefactor. It later became the cap. of Galilee, a position held previously by Seppholis. It continued to be the seat of gov. under Agrippa I. and under the Rom. procurators. After the destruction of Jerusalem (A.D. 70) it became a resort of the Jews. T. was the seat of a bishop under Constantine. It was taken by the Arabs in 637. Later, it was taken by the Tancred, who erected a church in the city, but lost by the Crusaders in 1187. The modern tn., Tabariyyeh, stands at the N.E. corner of the plain, some of the front walls actually rising out of the water. T., like tns. in Syria and Trans-Jordan, is built of black basalt, which gives it a sombre aspect. It is partly surrounded by walls and bastions, restored by Omar al-Daher. A new residential quarter has grown up outside the walls on the slopes to the N.W. of the old tn. To the S. of the tn. are the hot baths, famous for their curative properties in the Rom. occupation. The present baths were built by Ibrahim Pasha in 1833, during the Egyptian occupation, and additions were made in 1890 by the Turks. The therapeutic properties of the baths for rheumatism and skin diseases have long been recognised. The saline constituents of the water are chiefly sodium and calcium chloride and magnesium bromide, and the water is slightly radioactive. Below the baths is the tomb of the famous Talmudist Rabbi Meir, and to the N. of the tn. those of Maimonides and Rabbi Ben Akiba. At the N. end of Lake T. is Capernaum (Tel Hum), the synagogue of which has been excavated and re-erected.

**Tiberine Republic**, see under ITALY, History.

**Tiberiopolis**, see VARNA.

**Tiberius Claudius Nero** (42 B.C.-A.D. 37),

Rom. Emperor, the stepson of Augustus. He was the son of T. Claudius Nero and Livia, afterwards the wife of Augustus. He was carefully educated and became well acquainted with Gk. and Lat. literature. At the age of twenty-two he was sent by Augustus to restore Tigranes to the throne of Armenia. In 13 B.C. he was consul with P. Quintilius Varus. Three years before this he had been given charge of the N. wars together with Drusus, and during the years from 12 to 9 B.C. he had conquered Pannonia. He remained in Germany until 6 B.C. in which year he obtained the *tribunitia potestas* for five years, and retired with the emperor's permission to Ithodes. He returned to Rome at the end of seven years, and in A.D. 4 he was adopted by Augustus. In the same year he took command of the Rom. armies in N. Germany, and here he remained during the next seven years. On the death of Augustus, Tiberius hurried home, and the skilful management of Livia secured the throne to him without opposition. Tiberius was suspicious in character, and he began his reign by putting to death Postumus Agrippa, the surviving grandson of Augustus. Then he proceeded to make himself absolute. Tacitus admits that from A.D. 14 to 23 Tiberius governed with justice and moderation (*Annals*, Bks. I.-III.), but ascribes the departure of Tiberius from Rome to a desire to give full vent to his sensual inclinations in private. Tiberius had long hated Rome, and in A.D. 26 he left it, never to return. He first went to Campania on the pretext of dedicating temples there, but in the next year he moved to Capri, an is. off the Campanian coast. Meanwhile his minister Sejanus, in whose hands the real gov. of the state had long rested, was plotting to obtain for himself the imperial power. In A.D. 31 he was put to an ignominious death, to which many of his friends followed him. On March 16 Tiberius d. at the villa of Lucullus at Misenum, having been smothered by the order of Macro, the prefect of the Praetorians. The character of Tiberius has been one of the most disputed points in hist. Tacitus and Suetonius unite in painting it in the blackest colours. He is defended by Dean Merivale in *History of the Romans under the Empire* (1850-62), and by E. S. Beesly in *Catiline, Clodius, and Tiberius* (1878). See S. Baring-Gould, *The Tragedy of the Caesars*, 1892; J. C. Tarver, *Tiberius the Tyrant*, 1902; G. P. Baker, *Tiberius Caesar*, 1929; F. B. Marsh, *The Reign of Tiberius*, 1931; and L. C. Douglas, *The Iobes* (novel), 1942.

**Tibesti**, mountainous dist. of the Sahara, in the region inhabited by the Tibbus. The camels are valued in E. Sahara, and the dist. also produces donkeys, goats, and sheep.

**Tibet** or **Thibet**, **Tübet** or **Bod-pa**, country in Central Asia, nominally a dependency of China. It is bounded by the Kwenlun Mts. on the N., separating it from E. Turkestan; by China on the E.; by the Himalayas on the S., separating it from India, Bhutan, Nepal, etc.; and by

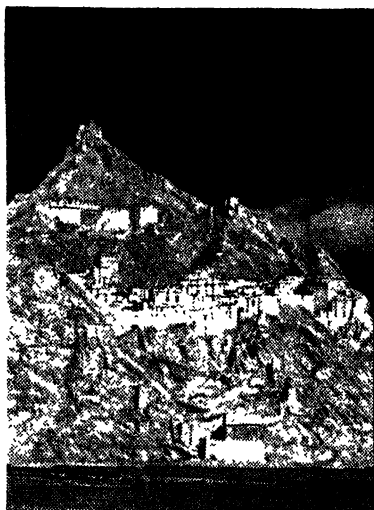


Kashmir on the W. The boundaries are, in some cases, ill defined, as, *e.g.* in Bhutan, where the bamboo forests appear to be accepted as the limit between the Tibetan rule as, too, was Darjeeling.

T. may be divided into four major physical regions: (a) the N. Plains (Chang Tang), a tangled mass of plains and valleys, averaging over 16,000 ft. and rising sev. thousand ft. higher in its mt. peaks and ridges, the most important of which are the Nien-chen-tang-la and the Hlungpo-Gangri ranges. This region is bounded on the N. by Kunlun and the steppes of Tsaidam and extends S. to the valley of the Tsangpo; (b) S. T. consists of the valleys of the Upper Indus and Sutlej in the W. and the great valley of the Tsangpo in the S. and E. The three great rivs. all have their source in the same region, near the sacred lake of Manasarowar; (c) E. T. comprises the mts. and valleys lying between the Chang Tang and the Chinese frontier. On the E. slopes of the Chang Tang rise the great rivs. of S.-E. Asia, the Salween, Mekong, and Yangtze; somewhat to the N. the Hoang Ho; and (d) the great Tsaidam basin with the Tsaidam swamp and the Koko Nor basin to the N.E. The N. Plains are treeless owing to the great elevation; vegetation is scanty grass, but sufficient to graze large numbers of yaks, asses, goats, sheep, and other animals. Few potatoes can be grown, so that food for herdsmen has to be brought from other parts of the country. Hence most of this great region is uninhabited and forms one of the main barriers of Central Asia. S. T. is T. proper, known to the Tibetans as Po (in contrast to the Chang Tang of the N.) and here are found the chief tns., Lhasa, Shigatse and Gyantse; it also includes the seat of the Dalai Lama and his gov. E. T. is a land of considerable natural resources, grazing is abundant, agriculture is possible on a large scale, and mineral wealth is known to be considerable.

Gold is found in T., and according to some explorers there are rich deposits in N. and E. T. which have been scarcely touched. Mining is carried on in only a few places, and though some gold is exported to China it amounts to little. Iron pyrites are found and lapis-lazuli and mercury in small quantities, also salt and borax among the lakes of the N. The climate varies considerably, though for the most part cold and dry. It is influenced by the S.W. monsoon, and high winds are frequent. In certain dists. the rainfall is very high and in parts extremes of cold and heat are felt. Sheep and cattle are reared, also goats, pigs, and poultry; and horses, mules, and donkeys are used. There are innumerable species of wild animals, including the yak, leopard, deer, antelope, bear, wolf, etc., and rare kinds of pheasants and partridges are also found.

Trade is carried on principally with China, Turkestan, Mongolia, India, and Indo-China. The Tibetans are keen traders, and the country is well supplied with trade routes. There is the Srinagar-Leh-Shigatse route, which is joined at



E. N. I.

TIBET. THE SHIGATSE-DZONG, OR LAMASERY OF SHINING CRYSTAL

Leh by the 'Hindustan-Tibet' road via Simla. But the most important route from India is from Kalimpong (Darjeeling dist.) across the Dzelep La via the Chumbi valley to Phari and thence by two routes to Lhasa. From Lhasa a great route strikes N. past Nagchuka and the Chang Tang, eventually reaching Urga. From Lhasa also a well-used route goes to Chamdo whence yet other routes branch off to Litang and Dango for Tatsienlu. Tatsienlu is an important entrepôt of trade and lies on the ethnographic frontier between T. and China. Here the wool of Tibetan sheep is exchanged for Chinese tea, which the Tibetans prefer to Indian. Twice a year caravans assemble for mutual protection near Koko Nor, and merchants and pilgrims together make the adventurous crossing to Lhasa.

The chief imports are silk, carpets, gold lace, tea, porcelain, leather, cotton goods, horses, and sheep, and the chief exports are wool and woollen goods, salt, rugs, furs, drugs, borax, and some gold and silver.

The people of T. are of Mongoloid origin, as far as is known, and they speak Tibetan, which is allied to Burmese, and comprises a number of dialects. The religion of the country is Lamaism (*q.v.*). Polyandry is a custom of the people, all the brothers in a family having the same wife, but this custom is not widespread. The country is divided into five prov., Amdo, Kham, Wu (which includes Lhasa), Tsang, and Nari. Once dependent on China, the real rulers of T. are the Lamas, whose authority is vested in the Dalai Lama at Lhasa. At Lhasa there

is a national assembly, or *Tsongdu*, which settles all the important affairs of state, and is responsible for the foreign policy of the country.

The mysterious land of T. from very early days was the objective of explorers. Its inaccessibility and the exclusiveness of its inhabs. merely operated as a spur to explorers, who knew that the rivs. which have their source within its mt. fastnesses have become the sacred rivs. of Hinduism and that the country was also the site of many of the most sacred shrines of Buddhism. Up to the time of the Brit. expedition of 1904 no European had succeeded in penetrating to Lhasa. In 1894 foreigners were allowed to advance as far as Yatung to the N. of the Himalayan state of Sikkim for trade, but the trade with what, before 1947, was Brit. India always remained small, T. continuing to derive the bulk of the tea it consumed in the form of brick tea by difficult routes from W. Szechwan. T. and India were linked by telephone in 1922. A line also exists between Lhasa and Gyangtze. The whole area of T. is between 700,000 and 800,000 sq. m., with a pop. estimated at between 4,000,000 and 5,000,000, the majority of whom live in the dists. between Lhasa and the Chinese border.

*History.*—Of the early hist. of T. little is known. In 639 Srongtsangampo founded Lha-lan, which later became Lhasa, and also introduced Buddhism into the country. From the fifth to the tenth century A.D. T. was a monarchy, which eventually disintegrated owing to opposition among the nobles to the increase of temporal power among the priesthood. This period of disunion lasted from the tenth to the thirteenth century. The greatest figure of this time was Atisha, the Indian Buddhist, who came to T. in 1026. In 1253 all the E. part of the country was conquered by Kublai Khan, and it was he who first placed the gov. in the hands of the lamas. The first priest-king was the abbot of the Sakya lamasery, but in the seventeenth century the Sakya line was overthrown by Nga-Wang Lob-sang, abbot of the Drepung lamasery, and he inaugurated the present line of rulers, the Dalai Lamas. It was not until 1720 that the country was finally brought under Chinese rule. In 1774 Warren Hastings made amicable contacts with the Tesho Lama, then regent of T. But these came to nothing of a permanent nature owing to Tibetan suspicion that the Eng. had fomented a Nepalese invasion of T. in 1792, and throughout the nineteenth century it proved impossible to come to any sort of agreement at all. India had always been anxious to open up trade with T., and between 1872 and 1886 three different missions were organised, but were abandoned. In 1888 the Chinese invaded Sikkim and a military expedition was sent to drive them out, which resulted in a treaty (1890-93). The lamas not having been consulted in the matter, they took offence, and revenged themselves by trying to bring about a treaty with Russia. Further inroads were made into Sikkim, and Lord Curzon, then viceroy of India,

came to the conclusion that strong measures were necessary. Col. (afterwards Sir) F. E. Younghusband was sent with an escort to see if he could come to terms, but he was unable to do anything. It was then decided to send an armed expedition, and in Dec. 1903 Col. Younghusband, with Gen. Ronald Macdonald in command of the troops, set out, and after some severe fighting they reached Lhasa on Aug. 3, 1904, and the Dalai Lama fled. Peace was concluded in Sept. by a treaty which provided against further incursions into Sikkim and estab. Brit. trade marts, and also prevented any foreign power receiving concessions in the country; the Tibetans also had to pay an indemnity. China concurred in this in April 1906. A treaty with Russia was concluded in the following year, in which it was agreed that no concessions should be sought by either power, and no expeditions dispatched without the consent of both countries, for a term of three years and Chinese suzerainty over T. was recognised. In 1908 the Dalai Lama was reinstated in Lhasa by Chinese authority; but in 1910 he was deposed and fled to Brit. protection in India. After the Chinese revolution of 1911 the Chinese agreed (1912) to leave the country and the Dalai Lama returned. In July 1912 the Chinese Gov. sent out another expedition with the object of reconquering T., but in consequence of a memorandum sent to China by the Brit. Gov., drawing attention to the Anglo-Chinese treaty of 1906, it was withdrawn. A conference was held at Simla, 1913-14, between England, China, and T., but the convention which was then drawn up assuring autonomy to T. was not ratified by China. Further trouble arose between T. and China in 1917, and in 1920 Sir Charles Bell (Brit. representative in T.) was invited to negotiate a peace at Lhasa. No final settlement was reached.

In 1933 the thirteenth Dalai Lama d., and a regent assumed control. In 1939 a new and very youthful Dalai Lama was discovered and installed with all the customary ceremony. The Tibetan Gov. admitted to Lhasa a Chinese mission of condolence on the death of the thirteenth Dalai Lama, and since 1939 the Republic of China has had a representative at Lhasa. The regent, who acts on behalf of the minor Dalai Lama, the temporal and spiritual head of the country, is assisted by a council (*Kashag*) of four ministers (*Shaps*). There is also a national assembly (*Tsongdu*) an advisory body containing most of the monastic and lay officials. In 1950, the rise of an apparently strong and centralised Communist regime in China appeared to offer a grave threat to Tibetan independence. Should Communist China absorb T., India would have a Communist country directly on her frontiers. As late as Nov. 1949, however, official Indian opinion remained outwardly conciliatory, admitting China's special ties with T. in the past, but firmly upholding present Tibetan autonomy, and stressing T.'s direct relations with India.

*Archaeology.*—An examination of the

wooden pillars in the halls of the two famous temples of Lhasa, the Tsuglakhang and the Ramoche strengthens the supposition that both buildings are the work of Nepalese craftsmen of about the thirteenth century. Only a few of the old frescoes are traceable, having been repainted in recent times. In Yerpa, on the road to Ganden, in a valley which opens a few m. E. of the capital on the R. Kichu are some very fine statues dating from the twelfth century and believed to be either Indian or influenced by Indian art. The place is famous from the fact that a great Indian teacher, who played a prominent part in introducing Buddhism into T. in the thirteenth century, passed much of his lifetime in that wilderness. In Ganden is the tomb of the reformer, Tsongkhapa, founder of the Yellow Church. The Kichu, where it enters the Tsampo (Tibetan name for the Brahmaputra) passes a number of places of much historical interest, such as Ramagan, with ninth century inscription; Usan, where the famous ninth century Sanskrit-Tibetan dictionary was written; Samye, built in the eighth century, noted for its temple inscriptions and statues of Indian workmanship. In the valley of On are two notable lameries: that of Ngari Takteang of the T'ang period, and that of Chodang famous as the habitat of Tsoukhapa. Some distance to the N.E. is the lamery of Zuehi, sacred to Tibetans for the image of Maitreya—the Buddha to come who now dwells in a heaven, awaiting his descent upon earth. Southward along the R. Chonghic, lies Changhic, where in the stronghold of the local sixteenth century princes the fifth Dalai Lama was born, one of the leading personalities of T. According to tradition the tn. is famous for the tombs of the Tibetan monarchs: they are natural hillocks eroded by the waters and then adapted by man. One of them is the tomb of Strongtsangampo, the real founder of the Tibetan power in the seventh century (see 'Hidden Treasures of Tibet,' by Prof. Giuseppe Tucci, in *The Times*, July 19, 1949).

**Literature.**—Tibetan literature began with the introduction of Buddhism and the trans. of the Indian classics. A second period began in the fifteenth century, mainly under Chinese influence, but Tibetan literature has never lost its religious character. Two of the most sacred books are the *Kangjur*, or the Canon of the Buddhist Law, trans. from the Sanskrit, and the *Tengjur*, a commentary upon the Canon in 225 vols. It is not known when printing or xylography was introduced into T. The text is printed from wood blocks on large sheets of paper, which are not bound, but placed between boards and wrapped in silk. A Tibetan book may weigh some thirty pounds. Apart from the sacred writings, T. is rich in folk-lore, short stories, and fables, handed down orally from generation to generation. The love of theatrical performances among the Tibetans has produced a stock of religious, historical, and fairy plays.

**Art.**—Tibetan painting is a sombre reflection of Lamaism, the earliest portrait being that of the goddess Tara, dating probably from the tenth century. The demonic subjects of Tibetan paintings are generally luridly depicted, while later Lamaistic paintings of a lighter character lose even this distinction, and have been pronounced as merely 'provincial Chinese art.' Tibetan architecture from an early time assumed an imposing style. Whence it originated is not known. It is distinguished for its solidity and massive design. Of old buildings still standing, the Jo Khang, the Lhasa Cathedral, and the huge lamasery of Samye may be mentioned. In the applied arts great skill and beauty were attained in the production of metal-ware, jewellery, and decorated swords. Most household utensils are of metal, chiefly copper, or wood, and the best worked metal-ware comes from the Derge dist. of Kham.

See Sven Hedin, *Central Asia and Tibet*, 1903. *Trans-Himalaya*, 1909-13; F. Grenard, *Tibet: The Country and its Inhabitants* (Eng. trans., 1904), (contains a long general account of the country); Sir F. E. Younghusband, *India and Tibet*, 1910; E. Teichman, *Travels in Eastern Tibet*, 1922, and 'Journeys through Kham' (Eastern Tibet), *Geographical Journal*, vol. lix., 1922; F. Kingdon Ward, *The Mystery Rivers of Tibet*, 1923; J. W. and C. J. Gregory, *To the Alps of Chinese Tibet*, 1923; I-tun-Shen King, *We Tibetans*, 1926; P. Sherap, *A Tibetan on Tibet*, 1926; Sir Charles Bell, *Tibet, Past and Present*, 1927; and, *The Religion of Tibet*, 1931; S. N. Wolfenden, *Outlines of Tibeto-Burman Linguistic Morphology*, 1929; D. Macdonald, *The Land of the Lama*, 1929, and *Twenty Years in Tibet*, 1932; H. Kaulback, *Tibetan Trek*, 1934; H. Forman, *Through Forbidden Tibet*, 1936; E. Schaefer, *Unbekanntes Tibet: durch die Wildnisse Osttibets zum Dach der Erde*, 1937; J. Hamburg-Tracy, *Black River of Tibet*, 1938; M. Pallis, *Peaks and Lamas*, 1940; A. Ghibaut, *Tibetan Venture*, 1947; S. Cutting, *The Fire-Dragon and other Years*, 1948; and E. Wentz (ed.), *Book of the Dead*, 1950.

**Tibetan Hound**, anct. breed of dog, used in Tibet as a watch-dog; it is a very powerful animal with a long coat. Mentioned in old Chinese literature and by Marco Polo, the T. H. is regarded as the ancestor of many present breeds.

**Tibeto-Chinese Languages**, see under LINGUISTIC FAMILIES.

**Tibullus, Albius** (c. 54-c. 18 B.C.), Rom. poet, was descended from an equestrian family, whose estate was at Pedum, between Tibur and Praeneste. In the year 28 B.C. he followed his patron, Messala, into Aquitania and thence into the E., but was taken ill at Corcyra and had to return. His poetry, addressed to two mistresses under the names of Delia and Nemesis, has little ardour, but is marked by its air of gentle tenderness and self-abnegation; on the other hand his bucolic elegies are some of the sweetest and best in the Lat. language. Horace was warmly attached to him. His tender

elegiac love poems, by their limpid clearness and remarkable finish, so probably justify Quintilian in putting T. at the head of all elegiac poets. The text of the poems was ed. by J. P. Postgate in Oxford Classical Texts, 1905, and with a trans. by him in the Loeb Library. The best eds. are by E. Bährns (1878) and E. Hüller (1885).

**Tibur**, see TIVOLI.

**Tic Douleureux**, see NEURALGIA.

**Tichborne Case**, one of the most celebrated trials in the annals of the Eng. criminal law. The prisoner, Thomas Castro, otherwise 'Bullocky Orton,' the big butcher of Wapping, was tried and convicted for perjury in putting forward in the civil courts a bogus claim to the Tichborne title and estates (1872). Not only did Orton, in posing as Sir Roger Tichborne, son of Sir J. F. Doughty Tichborne (d. 1862), answer with astonishing skill every question put to him in the civil actions, but even the real Tichborne's mother at first 'identified' him as her missing son. The whole proceedings cost the Tichborne family some £70,000 in legal expenses. In 1874 Castro was sentenced on two counts to two *cumulative* terms of seven years' penal servitude each. See J. Brown, *The Tichborne Case compared with previous impostures*, 1874; and Lord Maugham, *The Tichborne Case*, 1936.

**Ticinium**, see PAVIA.

**Ticino**, or **Tessin**: (1) Canton of Switzerland, lying on the Italian slopes of the Alps. Area 1088 sq. m. In the S. it merges into the Lombard plain. It is watered by the Ticino and its tribs. Cereals, tobacco, fruit, chestnuts, vines, and silk are cultivated. It was taken by the Swiss from Italy in 1512 and joined the League in 1803. Pop. 162,000. (2) Riv. of Switzerland and Italy, which rises in the above canton near Nufenen Pass, flows through Lake Maggiore and between Piedmont and Lombardy, and joins the Po 3½ m. S.E. of Pavia. Length 150 m.

**Tickhill**, tn. and par. of the W. Riding of Yorkshire, England, 6 m. S. of Doncaster. There are ruins of a Norman castle, an Augustinian priory, a thirteenth-century hospital of St. Leonard, and a fourteenth-century church. Pop. 2400.

**Tidemand**, Adolf (1814-76), Norwegian genre painter, b. at Mandal. From 1832 to 1837 he was a pupil at the Copenhagen Academy and later at Düsseldorf under Hildebrandt and Schadow. After visiting Munich, Rome, and Norway, T. settled at Düsseldorf in 1846, where he contributed much to the fame of the Düsseldorf School, and was a friend of his compatriot Hans Gude. Together with him T. painted *Night Fishing* (1851), *Funeral on Sogne Fjord* (1852), and *The Marquess of Landsdowne*.

**Tickell**, Thomas (1685-1740), Eng. poet, b. at Bridekirk, Carlisle, was appointed prof. of poetry at Oxford Univ. in 1711. His complimentary verse *Rosamund* brought him into touch with Addison, who, on becoming secretary of state in 1717 made T. his under-secretary. He

wrote much minor verse. His longest work being *Kensington Garden* (1722). His most popular *Lucy and Colin* (1725), his finest, the elegy prefixed to this ed. of Addison's works (1721). See R. E. Tickell, *Thomas Tickell and the eighteenth-century poets*, 1685-1740 (1931).

**Ticks**, or **Ixodidae**, family of Acarina (Mites), with flat bodies protected by horny shields. During part of their existence they are blood-sucking parasites on animals and birds, for which they have developed a rostrum or beak composed of two barbed harpoons above and a dart below. Eggs are laid on rough herbage and hatch into white six-legged larvae, which climb up the legs of passing animals and in some species complete their life hist. on the coat, but in others return to the grass for a period. T. cause irritation and anaemia, but their chief danger to their hosts is in the introduction of parasitic protozoa, causing such diseases as Texas fever and redwater.

**Ticonderoga**, vil. of New York, U.S.A., in Essex co., situated N.W. of Lake George, with manufactures of paper and wood-pulp. Graphite is found near by. During the Fr. War T. was unsuccessfully attacked by General Abercrombie, and General Howe was killed here in 1758. It was taken, however, by Amherst in 1759. In the War of Independence it was taken by Americans under Ethan Allen (q.v.), in 1775, retaken by General Burgoyne, on whose surrender it was abandoned, and reoccupied by the Brit. in 1780. Pop. 3100.

**Ticunas**, Indians found in Brazil and Peru around the confluence of the Javary and Marañon.

**Tides**, regular disturbances of the fluids on the earth, produced by the action of the gravitational forces of the moon and sun. The earth, having a diameter of about 8000 m., is subject to a stress due to the different degrees of gravitational pull. Some evidence of tidal action in the atmosphere is barometrically shown, but even in the tropics where it is greatest the difference in pressure never reaches 0.1 milibars. The oceanic waters are markedly disturbed, and the predominating influence of the moon is shown by the usual interval of 24 hr. 51 min. between similar phases being identical with the average interval between two successive passages of that body across the meridian. The following elementary investigation shows some of the quantitative results of tidal forces.

*Tide Raising-Force*.—Let  $E$  and  $M$  be the centres of the earth and the moon, respectively, and let a plane through  $E$  and  $M$  intersect the surfaces of the earth and moon in the circles  $NIZIP$  and  $QK$ , this plane lying in the plane of the paper (Fig. 1). Let  $r$  be the radius of the earth which will be assumed to be a sphere, and let  $ME$ , the distance between the centres of the moon and the earth, be  $R$ . Let  $M_e$  and  $M_m$  be the masses of the earth and moon, respectively, expressed in the same units (the unit is immaterial since only  $M_m/M_e$  is required). The attractive force of the earth on a unit mass anywhere

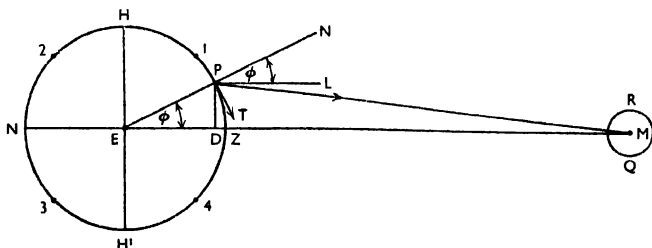


FIG. 1. TIDE-RAISING FORCE AND TRACTIVE FORCE

on its surface, say at  $Z$ , is  $g$ , where  $g$  is the force of gravity on the earth's surface. Since the attractive force varies directly as the mass and inversely as the square of the distance of the unit mass from the centre of the attracting body,  $g = M/r^2$ , provided a suitable choice of units is made. For the same reason the attractive force  $f$  of the moon on the same unit mass at a distance  $d$  from the moon's centre is  $Mm/d^2$ . Hence  $flg = Mmr^2/Md^2$  or  $f = gMmr^2/Md^2$ . If  $d = R$ , that is, if the mass is at the earth's centre, the moon's attractive force on it at the earth's centre is  $Mmr^2/M_e R^2$ . It will simplify the problem if the mean distance of the moon from the earth is taken throughout the computations, that is about 240,000 m., which is practically sixty times the earth's radius. Also, the mass of the moon is nearly  $\frac{1}{81}$  that of the earth, and substituting these constants in the above results, the attractive force of the moon on a unit mass at the distance of the earth's centre from the moon's centre is  $g/81 \times 60^2 = 0.0000324294g$ .

Now consider the attractive force of the moon on unit mass at  $Z$ : the distance  $MZ$  is  $59r$  and hence the attractive force is  $g/81 \times 59^2 = 0.0000035466g$ . Hence the difference between the attractive force of the moon on unit mass at  $Z$  and unit mass at  $E$  is  $0.0000035466g - 0.0000034294g = 0.000001172g$ , and this is the tide-raising force tending to move the unit mass away from the surface of the earth at  $Z$ . If the unit mass were on the other side of the earth at  $N$ , the moon's attraction on it is  $g/81 \times 61^2 = 0.0000033178g$ , which is less than that on the unit mass at the earth's centre, the difference being  $0.0000001116g$ . From this it is obvious that the tide raising force at  $Z$  acts in the direction  $ZM$  and that at  $N$  acts in the direction  $MN$ , because the pull on the earth's centre in the latter case is greater than that at  $N$ . It will be seen that the differential attraction of the moon or its tide-raising force is about 114 in 1000 million which is nearly the same as 1lb. in 4000 tons. Hence when the moon is in the zenith  $Z$  or the nadir  $N$  its lifting effect is about 1 lb. in 4000 tons, and a man weighing 12 stones would weigh about one-seventh grain less when the moon was in his zenith or nadir than he would when it was on his horizon at  $H$  or  $H'$ .

*The Tractive Force.*—The vertical

component of the differential force in the cases just considered is of no real importance in the production of T. We must turn to the tractive power of the horizontal components for this, and the following elementary investigation will show how this can be determined for any point on the surface of the earth. Take any point  $P$  on the circle  $ZHM$  and join  $P$  to  $E$  and  $M$  (Fig. 1). Draw a line  $PL$  parallel to  $EM$  and let the angle  $PEM$  be  $\phi$ . Then, if  $PD$  be drawn perpendicular to  $EM$ ,  $ED = r \cos \phi$  and  $MD = ME - ED = R - r \cos \phi$ . The attractive force of the moon on unit mass at  $P$  is  $gr^2/81MP^2$ , as previously shown, and this force must be resolved into two other forces at right angles to each other, the force along  $PL$  which is parallel to  $EM$ , and the force along  $PD$ . The first of these is  $gr^2 \cos$

$\widehat{LPM}/81MP^2$  and the second is  $gr^2 \sin$

$\widehat{LPM}/81MP^2$ . But  $\cos \widehat{LPM} = \cos \widehat{PMD} = MD/MP = (R - r \cos \phi)/MP$ ; and  $\sin$

$\widehat{LPM} = PD/PM$ . Hence if  $PM = x$ , we obtain the following two expressions for the components of the moon's attraction parallel to  $EM$  and at right angles to

$$\frac{g}{81} \frac{r^2}{x^2} \left( \frac{R - r \cos \phi}{x} \right) \text{ parallel to } EM,$$

$$\frac{g}{81} \frac{r^2}{x^2} \frac{r \sin \phi}{x} \text{ at right angles to } EM.$$

It has been shown that the force at the centre of the earth is  $gr^2/81R^2$  along  $EM$ , and the differences between this and the forces in the two directions already considered are, therefore, as follows:

$$\frac{g}{81} \frac{r^2}{x^2} \left( \frac{R - r \cos \phi}{x} \right) - \frac{g}{81} \frac{r^2}{R^2} \text{ parallel to } EM.$$

$$\frac{g}{81} \frac{r^2}{x^2} \frac{r \sin \phi}{x} \text{ at right angles to } EM.$$

The second force remains the same because the force along  $EM$  has no component perpendicular to  $EM$ . We shall deal with the first of these differential forces. Owing to the relatively great length of  $PM$  in comparison with  $PD$  the lines  $MP$  and  $MD$  can be considered as practically equal. Now  $MD = R - r \cos \phi$  and  $MP = x$ , hence  $x = R - r \cos \phi$ , from which  $R^2 - 2Rr \cos \phi + r^2 \cos^2 \phi = x^2$ , or  $R^2 - x^2 = 2Rr \cos \phi - r^2 \cos^2 \phi$ . The force parallel to  $EM$  can be expressed in the form

$$\frac{gr^2}{81} \left( \frac{R - r \cos \phi}{x^3} - \frac{1}{R^3} \right) = \frac{gr^2}{81} \left( \frac{1}{x^3} - \frac{1}{R^3} \right)$$

$$= \frac{gr^2}{81} \left( \frac{R^3 - x^3}{R^3 x^3} \right)$$

It has been shown that  $R^3 - x^3 = 2Rr \cos \phi - r^3 \cos^3 \phi$ , and hence we have

$$\frac{gr^2}{81} \left( \frac{2Rr \cos \phi - r^3 \cos^3 \phi}{R^3 x^3} \right)$$

Since  $r$  is very small compared with  $R$ ,  $r^3 \cos^3 \phi$  in the numerator and denominator and also  $r \cos \phi$  in the denominator can be ignored, being very small in comparison with the other terms, and the component force parallel to  $EM$  is  $\frac{gr^2}{81} \frac{2Rr \cos \phi}{R^3} = \frac{2gr^2}{81R^2} \cos \phi$ . The component

at right angles to  $EM$  is  $gr^2 \sin \phi / 81R^2$ , since  $x$  in the expression for this component can be replaced by  $R$ .

Fig. 1 shows these components acting at the point  $P$  in the directions  $P'L$  and  $P'D$ . If  $PT$  is a tangent to the earth

at the point  $P$  then  $\widehat{EPT}$  is a right angle and is equal to  $\widehat{LPD}$ , and hence  $\widehat{LPT} =$

$\widehat{EPD} = 90^\circ - \phi$ , and  $\widehat{TPD} = \phi$ . The component  $\frac{2gr^2 \cos \phi}{81R^2}$  resolved along  $PT$  is  $\frac{2gr^2 \cos \phi \sin \phi}{81R^2}$  and the component  $\frac{gr^2 \sin \phi}{81R^2}$  resolved along  $PT$  is  $\frac{gr^2 \sin \phi \cos \phi}{81R^2}$ . The sum of these two is  $\frac{3gr^2 \sin \phi \cos \phi}{81R^2} = 1.5 \frac{gr^2 \sin 2\phi}{81R^2}$ , which is the expression for the tractive force along the earth's surface.

If these components are resolved vertically upwards along the line  $PN$ ,  $EPN$  being the vertical line through the earth's

centre, then since  $\widehat{NPL} = \phi$  and  $\widehat{TPL} = 90^\circ - \phi$ , and the force along  $PD$  when resolved along  $PN$  acts in a direction opposite to the force along  $PL$  when resolved along  $PN$ , the resultant is  $\frac{2gr^2 \cos \phi}{81R^2} \sin \phi - \frac{gr^2 \sin \phi}{81R^2} \cos \phi = \frac{gr^2}{81R^2} (2 \cos \phi \sin \phi - \sin \phi \cos \phi)$ . If  $\phi = 0^\circ$  or  $180^\circ$  this last expression gives  $\frac{2gr^2}{81R^2}$  and if  $\phi = 90^\circ$  or  $270^\circ$  it gives  $-\frac{gr^2}{81R^2}$ . In the case of the horizontal component of the differential or tractive force when  $\phi = 0^\circ, 90^\circ, 180^\circ$ , or  $270^\circ$  it is zero. It reaches a maximum when  $2\phi = 90^\circ, 270^\circ, 450^\circ$ , and  $630^\circ$ , since in these cases  $\sin 2\phi = +1$  and hence in these circumstances  $\phi = 45^\circ, 135^\circ, 225^\circ$ , and  $315^\circ$ . These are marked 1, 2, 3, 4 in Fig. 1.

Instead of  $gr^2/81R^2$ , if we assume that  $R$  is always 60r this factor becomes 0.00000005716 and the maximum tractive force is  $1.5 \times 0.00000005716g = 0.00000008574g$ , which implies a force of about 1 lb. in 6000 tons. This is an indication of the relatively small force exerted by the moon in producing the tides. It is smaller still in the case of the sun as the following investigation shows. Instead of taking  $gr^2/81R^2$  for the moon, let  $R$  now denote the earth's mean distance from the sun,  $r$  as before being the earth's radius. The figures 81 must now be replaced by the ratio of the mass of the sun to that of the earth, or 333, 434, and since  $r/R$  is 0.000043, the cube of which is  $79507 \times 10^{-14}$ , the result is 0.0000000265g as compared with

0.0000000572 for the moon. This shows that the ratio of the tidal forces exerted by the sun and the moon is 265 to 572 or 1 to 2.16. We can say that the sun's tidal effect is about  $\frac{1}{2}$  that of the moon.

The problem of the T. is one of the most difficult in the whole range of dynamical astronomy and an adequate account of the subject is quite beyond the scope of this article. Something may be said, however, about Bernoulli's *equilibrium-theory*, which, it must be pointed out, is not only inadequate but is based on erroneous principles which give high water under the moon, irrespective of the depth of the water. Bernoulli supposed the earth to have a spherical solid nucleus surrounded by a shell of water of uniform depth, and his theory is briefly as follows:

Fig. 2 shows clearly the combined effects for the statical problem with a uniformly ocean-covered earth and no friction. At new and full moon both bodies are attracting in nearly the same line and give spring tides (left hand); at first and last quarter the attractions are at right angles, and high tide appears under the moon; low, under the sun. These are the neap T. Spring T. which occur at new and full moon, give a higher tide than the average and also a lower one than the average; neap T. at the quarters are lower at high, higher at low tide, than the average. The principle here being that due to the moon, the sun raises the low at the expense of the high  $\Phi$ . When the moon is in perigee spring T. are higher, and if this occurs about Jan. 1, when the earth is nearest the sun, the highest T. are produced; in each case low tide is correspondingly reduced. The relative heights of spring and neap T. are about 7 : 4.

*Rise and Fall.*—Since the earth with its waters is rotating, every place as it comes under the influence of external attraction has its waters gradually lifted to a maximum, then gradually dropped to a minimum. The *flooding* or *flood tide* is the former, the *ebb-tide* the latter movement. Alternating high and low T. should occur, according to Fig. 3, twice each in twenty-four hours; actually the average period is 24 hr. 51 min., since during the rotation the moon travels forward in its orbit, so that a place carried by the earth's rotation from high tide position completes a full rotation, but has to travel in addition another  $12^\circ$  or  $\frac{1}{2}$  hr. before coming again under the moon.

*Priming and Lagging.*—The T. *prime*, or arrive early, at the time of spring tide, the average interval being about 24 hr. 38 min.; at neap tides the interval averages 25 hr. 6 min., and the T. *lag*. These differences are due to the constriction of solar and lunar T. At new and full moon, when these T. coincide, the crest would be under the moon; at quadrature the solar wave crest and trough combining symmetrically with the lunar trough and crest respectively, produce merely a difference in height, not a displacement. In other positions displacement will occur owing to the combination

of the lunar and solar crests. This gives high tide, if the sun's influence is exerted to the W. of that of the moon, about half an hour ahead for the angle  $45^\circ$ , three days after full or new moon. The half-hour is gained from diminished intervals for the three preceding days. When the solar crest occurs to the E. of the lunar within a quadrant, the combined crest is found further E. and is reached later by a similar interval, giving lag.

port; at New York it is 8 hr. 13 min., with a variation of 22 min. either way during the month; at London Bridge it is 1 hr. 58 min.; at Bristol, 7 hr.; at Yarmouth 9 hr.

*Height of Tides.*—In the open ocean no accurate determinations have been made, but 2 to 3 ft. is the average height. Shallow seas, by diminishing the velocity, increase the height, which may be exaggerated again by entry into converging

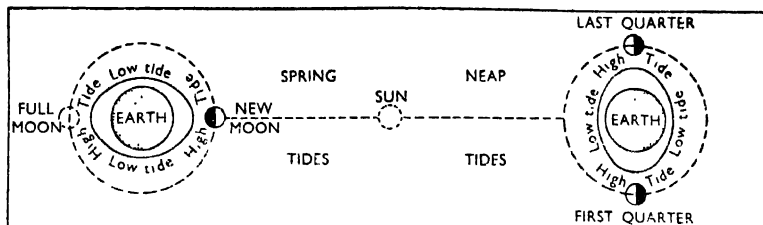


FIG. 2. OCEAN TIDES

*Diurnal Inequality.*—Twice a month the moon being at its farthest point N. ( $28^\circ$ ) of the celestial equator, the tidal wave crest is found in the N. hemisphere, its antipodal crest in the S. A sublunar place is carried round by the earth's rotation in a plane inclined at an angle to the diameter forming the crests, so that its record high tide is not at the antipodal crest but to one side of it, the second high tide being thus less than the first; this is known as the diurnal inequality.

The *theory of tides* has been worked out very completely by Sir George Darwin, with very many interesting and important results. For example, Lord Kelvin concluded, from an analytical study of thirty-three years' observation, that the earth as a whole must be more rigid than steel, but perhaps not quite so rigid as glass. The friction due to T. involves a loss of energy obtained from the earth's energy of rotation, and tends to retard it, thus lengthening the day by about 1 sec. in 120,000 years according to Dr. H. Jeffreys' theoretical investigations, confirmed by Dr. J. K. Fotheringham's work on the times of anct. eclipses. This retardation of the earth axial rotation implies less angular momentum in the earth-moon system, and to maintain the constancy of this angular momentum the moon must recede from the earth, thus lengthening the month. This forms the basis of Sir George Darwin's *tidal evolution theory*, which thus accounts for planets having receded from the parent body after separation.

*Actual Tides.*—The configuration of land and water, and the varying depth of the latter, are the chief elements in completely upsetting calculations from theory. High T. occur at all intervals before and after the meridian noon in different places. For any port the mean interval is known as the establishment of the

channels or estuaries. A hundred feet, it is said, has been recorded in the Bay of Fundy; at Bristol 50 ft. is attained, yet the E. coast of Ireland shows a range of only 2 ft. The effect of shallow water and projecting land, giving rise to reflection and interference, is to set up tidal currents, although the true tides give no displacement of water. Such currents entering riv. mouths give rise to the bore, eiger, or mascaret. It has been sometimes stated in text books that these currents may give rise to double T. as at Southampton, the falling T. of the channel driving through Spithead, the rising tide of the Solent, each giving high water. This erroneous explanation has been frequently exposed but is still repeated. The correct explanation, which is too long to be dealt with in this article, is given in Chapter

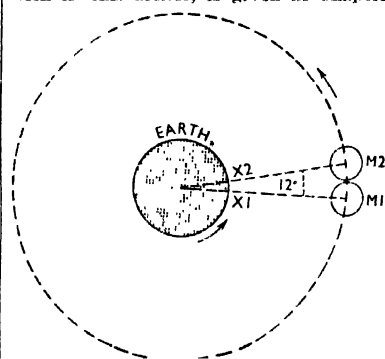


FIG. 3. SUCCESSIVE HIGH AND LOW TIDES

M 1, first position of moon; M 2, second position; X1, X2, tides

xxvi of the third book mentioned at the end.

*Uses.*—Physiographically T. aid in the destruction of coast-line and help to carry debris to the sea; they prevent the formation of deltas, yet aid rivers in building their lower flood plains. Biologically they have immense influence, the sea-shore 'between tides' having its peculiar life. Commercially they are useful in carrying vessels inland, and for the generation of electrical energy.

*Absence of Tides.*—Though theoretically tides are produced in all bodies of water, they are often inappreciable; thus Lake Michigan has probably a tide of 2 in. Enclosed seas such as the Mediterranean and Baltic have a tide of anything up to 1 or 2 ft.

*Tides in relation to practical navigation.*—In navigating coasts where the tidal range is considerable, caution is always necessary; for there are indraughts to all bays and bights, although the general run of the stream may be parallel to the shore. The turn of the tidal stream off-shore is seldom coincident with the time of high and low water on the shore. In open channels, the tidal stream ordinarily overruns the turn of the vertical movement of the tide by about 3 hours, forming what is known as tide and half-tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

The tidal predictions given in Part I. of the Admiralty's Tide Tables can generally be relied upon to give the times of high and low water within a few minutes and the heights within a few tenths of a foot; times and heights at 'secondary' ports, found by means of the tidal differences given in Part II., are considerably less exact than those predicted in the tables for 'Standard' ports; times and heights found from the tidal constants may be considerably in error and caution is advised, particularly in waters where diurnal inequality is great.

The datums used on the charts of different nations vary considerably. That adopted for the Admiralty charts founded on surveys carried out by the surveying vessels of the R.N. is, in waters where the diurnal inequality is small, the level of mean low water springs, and in waters where the diurnal T. is considerable, the level of Indian spring low water. As, however, a very long series of tidal observations is required before either of these levels can be definitely determined and as the chart datum depends, in most cases, on a few weeks' observation only, the datum adopted must always be considered as approximate and differs considerably in some cases from the theoretical datum. Where Admiralty charts are founded on the charts of other nations, the datum is that used by the original authority.

It has to be remembered by navigators that the tide may fall below datum, except in cases where the lowest possible low water has been used as datum. In waters where diurnal inequality is small the lowest tides usually occur when the

moon is near perigee and near the equator at springs, or at about the equinoxes; where diurnal inequality is great the lowest tides usually occur when both the moon and sun are in high declination at springs or at about the solstices. Wind or a high barometer may also reduce the height of the tide and cause it to fall below datum. (*Admiralty Pilot.*)

See G. H. Darwin, *The Tides and Kindred Phenomena in the Solar System*, 1898; H. Lamb, *Hydrodynamics*, 1932; and A. T. Doodson and H. D. Warburg, *Admiralty Manual of Tides* (H.M.S.O.), 1944. For tidal friction in shallow seas, see H. Jeffreys, *The Earth*, chapter XIV (2nd ed.), 1929.

**Tideswell**, tn. of Derbyshire, Eng., 6 m. E. of Buxton, in the Peak dist. It has a fourteenth-century church and an old grammar school. There are lead mines in the area. Pop. 2000.

**Tidore**, is. belong to the Moluccas, Malay Archipelago, situated off the W. coast of Halmahera. The cap., Tidore, on the E. coast. In the S. the is. is a symmetrical volcanic cone from which vapour occasionally rises. It is fertile, producing cotton, maize, fruits of various kinds, and tobacco and spices. In the early sixteenth century the Portuguese captured the is., but in the next century it became a Dutch colony. For centuries there has been a sultan of T., but his sovereignty to-day is purely nominal. Pop. 32,000.

**Tidworth**, vil. of Wiltshire, Eng., 9 m. W. of Andover and 76 m. from London by the S. Region railway. It is in the Salisbury area and is a military centre. Pop. of par. (North T.) 3000.

**Tiel**, tn. of the Netherlands, in the prov. of Gelderland, on the Waal, with a considerable trade in grain and wool. Pop. 12,400.

**Tielt**, old city in the prov. of W. Flanders, Belgium, 16 m. S.S.E. of Bruges. Its belfry dates from 1275. Chief manufs. are linen, woollen, and cotton goods. Pop. 12,900.

**Tienen** (Fr. Tirlemont), old city of Brabant, Belgium, 26 m. E. of Brussels. Situated on the R. Gete at the crossing place of the main road from Cologne to the N. Sea. T. is most probably of Rom. origin. It was a busy market in the early Middle Ages. At present it is the seat of the most important sugar-refinery of the country, producing yearly about 600,000,000 lbs. of sugar. There are also tanneries, breweries, and engineering-workshops. Pop. 22,300.

**Tienshan** (*Thian-Shan*, celestial mountains), mt. system of Central Asia, forming part of the boundary between Russian and Chinese Turkestan and extending N.E. from the Pamir to the W. fringe of the Gobi desert. The main range, including the ranges of Peter the Great, Trans-Alai, Kokshal-tau, and Sary-yassy, forms the border ridge of the High Plateau of E. Asia, to which they slope on the S.E. In this chain, with a general elevation of 15,000 to 20,000 ft., are the chief peaks, Kaufmann Peak (22,500 ft.) and Khan-Tengri (24,000 ft.), and the largest glaciers, and it is crossed by passes at an elevation



of 10,000 to 14,000 ft. On the N.W. slope are a series of shorter fringing chains, running parallel to the main ridge. The general elevation of these minor chains is 10,000 to 19,000 ft. Forest rises to about 9500 ft.

**Tien-Shan**, Region of the Kirghiz S.S.R., on the S. border, including part of the Tienshan mts. (q.v.).

**Tientsin**, treaty port and city of China, in the prov. of Hopei, at the junction of the Peiho with the Grand Canal, 76 m. S.E. of Peking. It is the emporium for N. China, with an extensive trade. The exports consist chiefly of coal, skins, cotton, wools, ground-nuts, beans, peas, and dates. In the Chinese-Jap. conflict in 1937 T. was bombed (July 28) and occupied by the Japs (July 22).

**Tiepolo, Giovanni Battisti** (Giam-battista), It. painter, b. in Vienna. His earliest master was Lazzerini, a noted painter in his day, but it was rather the work of Paul Veronese and of Titian that chiefly influenced him. His earliest known pieces are those in the chapel of Sta. Teresa in the Church of Scalzi at Venice. These pieces, in conception after the style of Piazzetta, have been criticised for affectation and wanton fantasy, but they have force and brilliance. His more individual taste lay in the direction of transparent atmospheric effects, in which he has never been surpassed.

**Tierra del Fuego** (Land of Fire), group of is. separated from the S. extremity of S. America by the strait of Magellan. It consists of sev. large is., the prin. one being called Tierra del Fuego or King Charles South Land (area 18,500 sq. m.), Navarin, Hoste, Clarence, Santa Inez, besides a number of much smaller size, the most important of which contains Cape Horn at the extreme S. The highest peak is Mt. Sarmiento (6900 ft.). It is inhabited by savages of low type, who now number less than 1000. T. was discovered by Magellan in 1520. Half of Tierra del Fuego Is., and the isles W. of it, belong to Chile, the rest forms an Argentine ter. (cap. Ushuaia) with an area of 8299 sq. m. and a pop. of 4900. Punta Arenas is cap. of the Chilean portion, Magallanes Ter. Large tracts of the Chilean is. are devoted to sheep-farming, largely by Brit. subjects. See M. Mielche, *Journey to World's End* (trans.) 1945, and E. Lucas Bridges, *Uttermost Part of the Earth*, 1948.

**Tiers Etat**, see THIRD ESTATE.

**Tiffin**, city and co. seat of Seneca co., Ohio, U.S.A., on the Sandusky R. It is the seat of Heidelberg Univ. (Reformed Church). Pop. 18,000.

**Tiflis**, or Thilisi, cap. of the Georgian S.S.R., on the Kura, 180 m. from Batumi. It was the cap. of the Georgian kingdom in the fifth century, and old T. contains many ant. buildings, including a sixteenth-century cathedral. Since 1917 T. has been extensively modernised: it is now an administrative centre, and the seat of Georgian heavy industry. Pop. 519,200.

**Tiger** (*Felis tigris*), huge and powerful carnivore, peculiar to Asia, though absent from Ceylon, Afghanistan, Baluchistan, and Tibet. The Indian T. rarely exceeds

10 ft. in length, and the female averages about 8 ft. 6 in. Fine males weigh from 400 to 500 lb. Young animals, which are characterised by their canine teeth being hollow throughout, are handsomer than older ones, the tawny orange colour being richer and the stripes darker and



TIGER

closer together. Ts. are monogamous, though there is no reason to suppose that they pair for life. The period of gestation is fourteen or fifteen weeks, and from two to five cubs are born, though more than two are seldom reared. Ts. will eat carrion, but generally kill for themselves. Their food consists principally of deer, antelopes, and smaller animals, but occasionally powerful ones are attacked, and they sometimes kill the wild boar. Man-eaters are not, as is the case with lions, old and worn out, and many are in splendid coat when killed after a meal on human flesh. The taste is generally acquired during a hunt from which the animal escapes after having mauled a man, but even man-eaters are known to hunt for other food. The T. has been crossed experimentally with the lion; the resulting hybrid, the *ligon*, is faintly striped: it is sterile.

**Tiger Beetle**, see CICINDELIDÆ

**Tiger-cat**, see OCELOT.

**Tiger Flower**, see TIGRIDIA.

**Tiger Lily**, see LILY.

**Tighina**, see BENDER.

**Tighnabruach**, tn. of Argyllshire, Scotland. It is a popular holiday resort, situated on the Kyles of Bute. Pop. 1000.

**Tiglath-Pileser**, name of sev. ant. Assyrian kings (see ASSYRIA), of whom the third of that name is mentioned in the Bible. He ascended the throne in 745 B.C. The revolution in the N. kingdom of Israel, which set Pekah on the throne of Samaria, appears to have coincided with a confederacy being formed against Assyria; the refusal of Ahaz to join it was the occasion of the determined assault made on the kingdom of Judah by Pekah and Rezin which led to the appeal to T. by Ahaz. In this campaign

T. besieged Damascus, and, apparently masking it, he proceeded to the conquest of Gilead and Galilee, deporting the inhabitants.

**Tigranes**, or **Dikran**, name of sev. kings of anct. Armenia, one of whom flourished as early as 550 B.C., and was a friend of Cyrus the Great, helping to overthrow the Median empire. The best-known bearer of the name (c. 121-55 B.C.) was the son-in-law of Mithridates the Great. He was king of Armenia (c. 96-55 B.C.), and master of the Syrian monarchy from the Euphrates to the sea (83), founding the city of Tigranocerta. T. at first supported Mithridates against the Romans. (76), but was defeated by Lucullus (69-68) and by Pompey (66).

**Tigridia**, or **Tiger Flower**, genus of bulbous plants (family Iridaceae), natives tropical America. They are grown in the cool greenhouse and also in warm borders, where the bulbs must be protected in winter.

**Tigris**, riv. of Asiatic Turkey rising in sev. branches, the chief being the Schat, Dije, or Dikla, in the frontier mts. of Armenia and Kurdistan, near Kharput and Bitlis. The chief headwater flows E., passing S. of Lake Gelik, S.E. and S. to Diarbekir, and E. to Tul, where it receives the Bolhan Su or Chai, which rises about 20 m. S. of Van and flows W. to this point. The stream then flows S., entering the plains at Jezire, and then S.E. to Kurna, where it unites with the Euphrates at Garinat Ali (70 m. from the Persian Gulf) to form the Schat-el-Arab. The chief tributaries are the Great and Lesser Zab and the Djala or Shirwan, all coming from the E. On the banks are Mosul, Tokrit, and Bagdad, and the ruins of Nineveh, Seleucia, Ctesiphon, the ancient Mesopotamia lying between it and the Euphrates. Length 1150 m., navigable by steamers to Bagdad. The construction of the first railway-bridge over the riv., at Bagdad, was begun in 1949.

**Victory of the Tigris** (Oct. 23-30, 1918).—This was the last battle fought in the First World War by a Turkish army. The Turkish army on the Tigris, numbering 10,000 rifles and fifty-nine guns, under the command of Ismail Hakki, surrendered on Oct. 30, 1918, to Lieut-General Sir W. R. Marshall, this victory opening the road to Mosul and leaving the greater part of Mesopotamia in the hands of the Brit.

**Tihwa**, **Tihwafu** (called by the Russians **Urumchi**), cap. of the Chinese prov. of Sinkiang. The mts around T. are full of unexploited metals. Irrigation is good, but the only export of importance, as at 1943, was wool, substantial quantities of which were used to clothe the Soviet Red Army.

**Tilburg**, tn. of N. Brabant prov., Holland. It is a great industrial centre, manufacturing cloth, woollens, soap, leather, etc. There is an economic univ. (1800 students). Pop. about 115,800.

**Tilbury Fort and Docks**, fortification in Essex, England, on the Thames opposite Gravesend, enclosed by a moat. Origin-

nally built by Henry VIII., it was enlarged by Charles II. The troops raised in anticipation of a Sp. invasion were reviewed here (1588). The docks (507 ac.) which lie 1200 ft. above Tilbury Ness, opposite Gravesend, 26 m. below London Bridge and about the same distance from the Nore, were opened in 1886, and formerly belonged to the London and India Dock Company, but are now under the control of the Port of London Authority. The great development of trade since 1886 has rendered frequent changes necessary. The latest extensions were begun in 1917, when the Port of London Authority extended the main dock 1450 ft. These extensions, which were completed in 1928-29 at a cost of £2,500,000, enable London to compete for the large ocean-liner traffic. They comprise a new entrance dock, 1000 ft. by 110 ft. with a depth of 45½ ft. below T. H. W. at centre of sill a floating structure, a dry dock 750 ft. by 110 ft., and a passenger landing stage 1132 ft. in length, at which vessels can be dealt with at any state of the tide, day and night. The dry dock is so constructed that it can be extended when necessary, without interference with its use, to a total length of 1000 ft. There are over 35 miles of railways in the Tilbury Docks.

**Tilden**, **William Tatem**, (b. 1893), Amer. tennis champion and author, b. at Germantown, Pa. Educated at Germantown Academy and the Univ. of Pennsylvania he was world's champion of lawn tennis in 1920, 1921, and again in 1930, and with F. T. Hunter won the men's doubles at Wimbledon in 1927. He was for ten years a member of the U.S. Davis Cup team. In 1931 he became a professional player and was Amer. professional champion.

**Tile**, thin plate of various materials, such as baked clay, porcelain, earthenware, marble, glass, etc., used for roofing, flooring, walls, fireplaces, etc. Whether glazed or unglazed, flat or curved, simple or decorated, the manufacturing processes are essentially the same as those for brick-making. Ts. are often embossed or painted with a design, painted Ts. being known as encaustic Ts. Roofing Ts. of marble-coloured clay were known in anct. Greece and Rome, and coloured glazed roofing Ts. were used in old China and Japan. Ts. of baked clay in anct. times were used for preserving written records, especially in Assyria and Babylonia. Roofing Ts. are sometimes made with a concave (pantiles) or ridged surface. Flooring Ts. of medieval Europe were generally mosaic in type. Elaborate wall Ts. were known to the anct. Egyptians and were later introduced into Rome and Persia. Old Moorish Ts. were noted for their metallic lustre. Wall Ts., to-day are made in a considerable variety of shades. Flooring Ts., to-day, being generally machine-pressed, are hard and vitrified.

The manuf. of building T. was a widespread and important industry in Rom. Britain, and tile-makers adhered more closely to Rom. ways than did the

potters. An imperial tile-works is known: the legions frequently made their own T., and municipal as well as private factories were in being. They are located by their tile-maker's stamps. From a stamped tile found in London, the existence of a financial office has been deduced. In S.E. England, T. stamped *Classis Britannica*, the Brit. Channel Fleet, are known. Most fascinating, however, are the messages, epithets, and idle scribbles made on the wet T., and preserved by firing. Medieval T., which are of costume, heraldic, and artistic interest, are a study in themselves. The Rutland Collection in the Brit. Museum has more than 7000 examples ranging in date from the thirteenth to the sixteenth centuries and including some 4000 different forms and designs. There is a complete tile floor from a fifteenth-century secular house at Bristol, and sev. portions of floors from monastic houses.

**Till**, see BOULDER CLAY.

**Tillage**, see CULTIVATION.

**Tillamook Language**, see under NORTH AMERICAN NATIVE LANGUAGES, *Pacific areas*.

**Tillandsia**, or Spanish Moss, or Old Man's Beard, named by Linnaeus after Tillands, a Finnish prof., is a genus of Bromeliaceae (*q.v.*). *T. usneoides* hangs down from trees in tropical America like long dry beards. It is used for stuffing birds. *T. utriculata*, or wild pine of Jamaica, also a parasite, has large leaves, with expanded bases, which retain rain water as if in a bottle. Species cultivated in Britain as perennials are *T. circinnata* with lilac bracts and *T. duvaliana*, with yellow and green bracts.

**Tillett, Benjamin** (1860-1943). Brit. Labour leader and politician; b. in Bristol and began his career in a brickworks, later joining the R.N. Subsequently he organised the Dockers' Union, of which he became general secretary. T. largely organised the dock strike of 1889. He shared responsibility for the developments which placed the general labour unions in an equal position with the organisations of skilled craftsmen inside the Trade Union Congress. He was M.P. (Lab.) for N. Salford (1917-24) and president of the T.U.C. 1929. T. pub. a short hist. of the Dockers' Union in 1910, and his *Memories and Reflections* in 1931.

**Tillcultry**, tn. of Clackmannan, 5 m. from Alloa. It is situated on the R. Devon and is noted for plaids and tartans. Pop. 4500.

**Tillotson, John Robert** (1630-94). Archbishop of Canterbury, b. at Ilalifax, of a Calvinist family; educated at Cambridge. He was at first a Presbyterian and accepted the Act of Uniformity. At the Restoration he became chaplain to Charles II. (1666). In 1672 he became Dean of Canterbury, in 1675 Canon of St. Paul's, in 1689 Dean of St. Paul's, and in 1691 Archbishop of Canterbury. He was a strong anti-Catholic, and pub. *Rule of Faith* (1666), four lectures on the Socinian controversy. His sermons are famous for their prose style and are among the best examples of the pulpit oratory of his

times. See selections ed. by G. W. Weldon, 1886, and by J. Moffat, 1926.

**Tilly, Johann Tzerclaes, Count von** (1559-1632). Ger. soldier, b. in Tilly in Brabant and brought up by Jesuits. He served in the Sp. army in the Netherlands. Later, he left the Sp. service for Austria, and in 1607 became gen. of the Bavarian army and Catholic League, greatly distinguishing himself during the Thirty Years' war. He won the great battle of the White Mt., near Prague, in 1620, and was also victorious at Wimpfen, Stadt-John, Wiesloch, and Kockst. In 1630, T. was appointed commander-in-chief of the imperial forces, and besieged and took Magdeburg, after a fierce struggle. Four months later, however, he was defeated by Gustavus Adolphus at Breitenfeld, and shortly after, again on the banks of the Lech, where he was mortally wounded, and d. at Ingolstadt the following day. See Count Villermont, *Tilly ou la guerre de trente ans*, 1859; O. Klopp, *Tilly im 30-jährigen Kriege*, 1861, 1891-6; Keym-Marcour, *Johan Tserclaes Graf von Tilly*, 1884; life by G. Gilarione, 1932.

**Tilman, Harold William**, Brit. mountaineer (b. 1898), advocate of the small mobile Himalayan party, and leader of the 1938 Everest expedition. He had a distinguished record in the First and Second World Wars, has explored many mt. dists. in Africa and Asia, and led the first ascent of Nanda Devi in 1936. He has written *Ascent of Nanda Devi* (1937); *Snow on the Equator* (1938); *Mount Everest* (1938); *When Men and Mountains Meet* (1947); and *Two Mountains and a River* (1949).

**Tilsit** (or **Sovietsky**), tn. of the R.S.F.S.R., formerly of E. Prussia, on the Memel (Niemen), 65 m. N.E. of Königsberg (Kaliningrad). There are iron foundries, glass, cloth, and machinery manuf., cellulose is produced, and there is trade in grain, coal, cattle, etc. Here, Napoleon I. concluded treaties with Russia and Prussia in July 1807 by which Prussia lost her possessions west of the Elbe, and Westphalia was formed out of W. Prussia and Hanover. Prussian Poland was assigned to Russia and Saxony; and the Czar Alexander I. was to join an alliance with Napoleon against England. In 1945, when E. Prussia was overrun by the Russians, T. was joined to the Soviet Union. Pop. 57,700.

**Timæus** (c. 352-c. 256 B.C.), Gk. historian, was the son of Andromachus, tyrant of Tauromenium in Sicily. He was banished from Sicily by Agathocles, and passed his exile at Athens, where he had lived fifty years at the time when he wrote the thirty-fourth book of his History. This, his greatest work, was a hist. of Sicily from the earliest times to 264 B.C. See J. B. Bury, *The Ancient Greek Historians*, 1909.

**Timæus of Locri**, Pythagorean philosopher contemporary with Plato. To him is usually ascribed the work *περί τῆς ψυχῆς* ('Concerning the Soul of the Universe'), written in the Doric dialect. It deals with the same subjects as Plato's dialogue *Timæus*.

**Timaru**, seaport and city of S. Is., New Zealand, on the E. coast between Christchurch and Dunedin, cap. of S. Canterbury dist. The climate is equable, with little rain, and there are some 400 ac. of scenic and recreational reserves. It was the first N. Zealand tn. to operate a tn. planning scheme. Industries include the manuf. of woollen goods, footwear, pottery, furniture, flour, and allied products, agric, implements, and engineering products and the frozen meat industry is carried on nearby. There is an airport, and a good harbour, the area of which was doubled during the Second World War. It became a city in Nov. 1948. Pop. 21,100.

**Timber** is loosely classified as hardwood from Dicotyledonous trees and softwood from Gymnosperms. Owing to the great variations in hardness, even in wood of the same species of tree, this classification is misleading. The *grain* of T. is determined by the direction and arrangement of the tissues and the width of the annual rings. The *texture* is close or open, according to the diameter of the wood vessels. Experts can frequently classify T. by noticing the colour, hardness, weight, annual rings, or their absence, and the size and distribution of the wood vessels. Microscopic examination may be needed to supplement macroscopic observations. Felled T. trees should be removed immediately to the sawmills or to storage sheds. The freshly-felled tree contains moisture which must be removed before the wood can be converted into useful T. This removal of moisture is the process of seasoning, a long, slow, natural process that can be greatly expedited artificially. Natural seasoning is accomplished by storing the T. in a shed free from draught, provided with air circulation, and sheltered from the sun. Whole logs seasoned in this way remain wet in the middle and when sawn into pieces warp, owing to shrinkage, and split.

In the earlier part of the nineteenth century, smoke kilns were used in France for artificial seasoning, and steam and smoke passed through holes in the floor of the kiln and escaped through flues. Subsequently various kilns have been invented, and the most modern types provide for thermal circulation of air and the condensation of moisture by cold pipes or sprays. T. of different thicknesses can be dried in different compartments, each provided with separate controls of air circulation, temperature, and humidity. Seasoning increases the durability of wood, since decay cannot take place in the absence of moisture. Air also favours decay, and, in consequence, deeply buried or submerged wood is protected by the absence of air, while the parts of telegraph and other poles, of fences, and of wooden piles just above the surface of the soil, or of the water, decay most rapidly. T. exposed to conditions favouring decay, to attacks of insect-borers, and of ship-worms, to the growth of fungi, to mechanical abrasions, and to fire, should be preserved. Softwoods are liable to 'brown rot,' a fungal

decay which affects the cellulose and associated carbohydrates. Decay in hardwoods occurs from 'white rot,' in which all the constituents of wood are attacked. 'Dry rot' has a specialised meaning, as caused by one or two fungi such as *Merulius lacrymans*. The Gks. and Roms. killed superficial wood pests by charring to a depth of one-eighth to one-half an in. This decreases the strength of the T. Recent preservative measures lie in thoroughly brushing the surface with special paint, kalsomine, or other preservative. More effective is the method of dipping the wood into a bath of the preservative and making it penetrate deeply into the tissues. Creosote oil is one of the best general preservatives. Oak is suitable for use indoor and out; walnut, maple, sycamore, and beech only in dry places. Ash, one of the best tough, pliable woods, is extensively used in aircraft, and in sports apparatus.

Felled timber is cut and made into planks in the sawmill, which may be water- or power-driven. The saws used are either circular saws, frame saws, or bandsaws. See *Saws*.

See W. S. Jones, *Timbers: Their Structure and Identification*, 1924; S. Recond and R. Hess, *Timbers of the World*, 1943, and H. T. Eyres, *Introducing Wood: Facts for all who handle it*, 1950.

**Timber (in Law)**. In real property T. means oak, ash, and elm by general custom, and various other trees by local custom. It becomes important to consider what T. denotes when construing the powers of a tenant-for-life under a settlement (*q.v.*). A tenant-for-life, unless expressly authorised, is liable for *Waste*, and felling T. is an act of *Voluntary Waste*. Neither T. nor *germins* (*i.e.* T. trees under twenty years) may be cut by a tenant-for-life, except that he may cut germins for necessary thinning of overgrown plantations and, on recognised 'T. estates,' he may periodically cut so much T. as by local usage is regarded as annual fruits of the land so cultivated. By the Settled Land Act, 1925, the tenant-for-life, even though impeachable for waste, may with the consent of the court, cut and sell T. ripe and fit for cutting, most of the proceeds of which must go to 'capital money' for the benefit of the inheritance, and the residue as rents, and profits to himself; if not impeachable, he takes all the proceeds. A tenant for life, unimpeachable for waste, is entitled to the proceeds of sale of ornamental T., properly cut to preserve adjacent T.

**Timbrel**, or **Tobret**, Heb. musical instrument, like the modern tambourine.

**Timbuctoo** (Timbuktu, Timbuktoo, or Tomboustou), tn. of the colony of Fr. Sudan, near the Sahara, 9 m. N. of the main stream of the Niger. Its position makes it a focus of caravan routes between Algeria, Morocco, and Tuab, and of traffic on the Niger, and it thus has considerable importance as a trade centre. It exports ostrich feathers, gums, salt (from Taudeni), and kola-nuts to Senegal, the Guinea Coast, and Morocco. Most of the houses are of straw and earth, but

there are a few brick buildings, some mosques and schools including a Moslem superior school, called a *médersa* (official), and a citadel and forts. René Caillé (q.v.) in 1824 approached the Niger at T. where his life was in constant danger. He was, however, not the first white man to discover T.: an Englishman, Maj. Laing, setting out from Tripoli, had reached this mysterious city of caravans and had been murdered there. In 1863 Faidherbe (q.v.), having routed his formidable adversary, El Hadj-Omar, lord of a vast region, concluded an agreement with the masters of T. But it was not until 1895 that Commandant Joffre (q.v.) seized the city and built a string of forts around it which have since then secured Fr. domination of this region. In 1904 it combined with Zinder-Chad to form the military ter. of the Niger. In 1920 it was formed into a military ter. incorporated in Upper Senegal-Niger, but in 1923 was converted into a civilian ter., under a lieutenant-governor. See P. Marty, *La région de Tombouctou*, 1920 Pop. 6500.

**Time and Time Measurement** may be determined by reference to some regular occurrence of any natural phenomenon. Thus the day is determined by the rotation of the earth on its axis, and the year by the apparent revolution of the sun round the earth, actually that of the earth round the sun. *Sidereal T.* is employed only in astronomical work, for definition of the *sidereal day*, which, unlike the solar day, is of constant length (see below). *Apparent T.* is taken from the revolution of the sun, the mean solar day being the interval between two consecutive southings of the mean sun. The mean solar T. in any instant is the mean sun's hour angle, which can be converted into time by taking  $15^\circ$  as one hour,  $15'$  as one min., and  $15''$  as one sec. T. can easily be determined by travellers by observing the transits of known stars across known vertical circles. At sea different methods can be used. A simple method is to observe the altitude of the sun or a well-known star whose spherical co-ordinates are given in the *Nautical Almanac*. Then, the latitude of the place being known and also the Greenwich Mean Time (given by a chronometer or time signals), the local time can be computed. Local T. varies with the longitude, it being one hour in advance of or behind the true Greenwich T. for every  $15^\circ$  to the E. or W. of Greenwich respectively. Owing to the confusion from the various local Ts., a standard T. has been introduced, the Greenwich T. being taken as the standard. This is known as *Greenwich Mean Time*, *Greenwich Civil Time*, or often as *Universal Time*.

**Time Measurement.**—The ultimate standard to which all systems of T. measurement are referred is *sidereal T.* The *sidereal day* is defined as the duration of a complete rotation of the earth on its axis relative to the stars. The sidereal day begins at a given place when the *First Point of Aries* (q.v.) is on the meridian. One of the duties of the Astronomer-Royal is to provide the nation, and, as we

shall see, the civilised world, with a T. scale. A very accurate clock, known as the sidereal clock, is checked daily by astronomical observation of the instants when certain stars, known as clock stars, cross the meridian. In actual practice, time is measured by the length of the *mean solar day*. A solar day is the duration of a complete rotation of the earth on its axis relative to the sun. The length of a solar day varies because the earth's orbit round the sun is elliptical and because the earth's axis is not perpendicular to the ecliptic (q.v.) or the plane of its orbit. For time measurement clocks are referred to the *mean solar day*, which is divided into twenty-four mean solar hours. The length of the mean solar day is constant and it refers to the duration of one complete rotation of the earth on its axis relative to an imaginary body, the mean sun. The zero of this time measurement is the instant when the mean sun crosses the meridian at a given place. In England this place is chosen as Greenwich, and whereas the zero of T. measurement was formerly referred to the instant at which the mean sun crossed the meridian in the cap. of a given country, it is now the implicit common practice to refer all T. measurements to Greenwich. What is known as Greenwich Mean T. (G.M.T.) is T. measured from the zero of the Greenwich mean solar day. Formerly this day began at noon, but from Jan. 1, 1925, astronomers adopted a day of twenty-four hours beginning at midnight.

The checking of G.M.T. from sidereal T. is a matter of astronomical computation (vide *Whitaker's Almanack*). The advent of radio had simplified the regulation of clocks by means of the Greenwich standard clocks, since T. signal are broadcast.

**Standard Times.**—Since 1883 the system of Standard Time by zones has been gradually accepted and now almost throughout the world a Standard Time which differs from that of Greenwich by an integral number of hrs., either fast or slow, is used. A list of times in various regions of the world at 12 noon Greenwich Mean Time is given in the *Nautical Almanac* (ann.) and displayed in diagrammatic form in most good atlases. It is to be noted however, that changes in standard times are often made without long previous notice, also that in the *Nautical Almanac* no account is taken of Summer Time in any country. Zone times have been adopted in various large countries. In Canada and the U.S.A. five standard times are used, the zones being bounded by meridians of long.  $15^\circ$ —the equivalent of 1 hour apart. Within each zone the mean time for the meridian midway between each of the meridians  $15'$  apart kept. In the U.S.S.R. hourly zones from 3 hrs. to 13 hrs. fast on Greenwich time are used.

See also EQUATION OF TIME; HOROLOGY; For Summer Time see DAYLIGHT SAVING. INTERNATIONAL DATE LINE; SUNDIALS. For T. in relation to space see RELATIVITY; SPACE AND TIME.

**Timentel, Eleonora**, see FONSECA, MARCELA DE.

'Times, The.' This daily newspaper was founded in 1785, under the title of *The Daily Universal Register*, by John Walter, mainly in order to prove the advantages of the 'logographic' process of setting up type by units consisting of whole words or groups of letters as well as by single letters. The process failed and was quickly discarded; but the newspaper succeeded, especially after Jan. 1, 1788, when it took the title *The Times*. In 1802 he was succeeded as editor, and in 1803 as sole manager, by his younger son, John Walter II., under whom the paper maintained, through many struggles, its complete independence and immensely increased its circulation and power. Through the Napoleonic wars it frequently pub. news before the Gov. had received it; and its staff of writers, which included a young clergyman, Peter Frazer, Edward Sterling, and John Stoddart, made the leading articles a political force respected both at home and abroad. Stoddart was appointed editor of the paper. He was succeeded in 1817 by Thomas Barnes, who held the chair till 1841 and brought the paper to the height of its reputation and power.

He died in harness, and was succeeded by John Thaddeus Delane, then only 23. Being independent of party ties, John Delane took his own political line. In 1846 he practically forced upon the hesitating gov. the repeal of the Corn Laws. John Walter II. having died in 1847, his son, John Walter III., succeeded him as chief proprietor, and did much to foster the mechanical side in which as of old, *The T.* was a pioneer. During the Crimean war, having organised its war correspondence on a scale never before attempted, it ruthlessly exposed, chiefly through the pen of W. Howard Russell, the faults in the conduct of the fighting and the equipment of the troops; and it was mainly through Russell's articles that Florence Nightingale was moved to go upon her mission, in which she was assisted by a large fund raised by *The T.*

In 1848 came the first rotary printing-press, invented by Applegath, and in 1866 the famous Walter press, which remained in use for nearly 30 years; and in 1879 (not long after Delane's retirement) Kastenbein, working in *The T.* office, perfected the first type-setting machine. Delane was succeeded by Thomas Chennor, who held office till his death in 1884, to be followed by G. E. Buckle, then twenty-nine years of age. The outstanding feature of Buckle's reign was the vigorous and successful opposition of the paper to Gladstone's proposals for Home Rule. The articles on 'Parnellism and Crime' contributed by a brilliant Irish writer, John Wolfe Flanagan, were the chief occasion of the Parnell Commission, which was appointed to examine the attacks made by *The T.* on Irish leaders and to investigate the truth about a letter attributed to Parnell. The letter was found to be a forgery, but most of the charges made by *The T.* were pronounced true. In 1889 C. F. Moberly Bell was appointed manager of *The T.* In spite

of the increased circulation of cheaper journals, the paper was still, contrary to general opinion, extremely prosperous; but the costs of the Parnell Commission had been enormous; the resources of the paper were being wasted; and after the death of John Walter III., in 1894, a system of ownership by which the printing business and the newspaper were held separately made efficient organisation difficult.

In July 1907, after 122 years, *The T.* was for sale. The controlling interest was bought, through Moberly Bell's negotiation, by Lord Northcliffe, who, with Moberly Bell as manager, immediately began to equip the printing office with the newest machinery and to make certain changes in organisation and detail. *The T.* had resumed its old position in the van of newspaper progress when in 1911 Moberly Bell died at his desk. In 1912 Buckle retired, a few weeks before the 40,000th number of *The T.* was pub. In his reign the jour. proper had been reinforced by the Literary Supplement (1902), the Educational Supplement (1910) and the Engineering Supplement (1905). He was succeeded by Geoffrey Dawson (q.v.). In May 1913, the price of *The T.* was reduced from 3d. to 2d.; and in March 1914, to 1d. In one night the circulation was for a time trebled; and it was with a daily circulation of 150,000 that it faced the outbreak of the First World War. During the War the paper did more than maintain the reputation of its news service; and it could point to a long list of suggestions first made in its columns which the Gov. adopted. Among the many subsidiary pub. of *The T.* issued in connection with the war may be mentioned its War Atlas, *The T.* History and Encyclopedia of the War, and *The T.* Broadsheets—passages of Eng. literature printed on single sheets of paper and distributed by millions among the troops. In 1919 Dawson resigned and was succeeded for a time as editor by Wickham Steed. In 1921 *The T.* raised more than £170,000 for the preservation of Westminster Abbey.

In Aug. 1922 Lord Northcliffe d. In Oct. the ownership of *The T.* was bought by John Walter (fourth of the name, and great-grandson of the founder) and Major the Hon. John Jacob Astor, who became Chairman of The Times Publishing Company; and in Jan. 1923 Geoffrey Dawson returned to the editorial chair. In 1925 *The T.* raised more than £250,000 for the preservation of St. Paul's Cathedral. In May 1926 *The T.* was the only one of the London daily newspapers which produced a number every day throughout the General Strike. Geoffrey Dawson d. in 1941 being succeeded by R. McE. Barrington-Ward, under whom the paper, pre-eminently the Brit. journal of opinion and therefore the paper most quoted abroad, became much more aware of the real current of opinion in Britain than it ever was in the days of his predecessor. The present editor (1950) is W. F. Casey who joined the staff of *The T.* in 1913 and became deputy editor in 1941.

The financial control of *The T.* is governed by a trust deed which prevents the sale of shares except with the assent of a body of trustees consisting of the Lord Chief Justice, the President of the Royal Society, the Governor of the Bank of England, the President of the Institute of Chartered Accountants, and the Warden of All Souls College, Oxford. See *The History of The Times*, vol. 1; *The Thunderer in the Making*, 1935, vol. 2; *The Tradition Established*, 1939, vol. 3; *The Twentieth Century Test*, 1947.

**Times Literary Supplement**, Brit. Jour. pub. weekly by the Times Publishing Co. Ltd. It was founded in 1902, and is the leading jour. in the field of literary criticism, noted for its independent and reasoned judgment. It offers, besides book reviews, articles of interest to authors, publishers, and, above all, readers, on literary and allied subjects. In recent years it has contributed largely to the growth of public interest in literary and historical biography.

**'Time and Tide,'** independent, non-party weekly review (price 6d.), founded in 1920 by Viscountess Rhonda. Regular features include editorial comment and background articles on current politics, book reviews, financial notes, and criticism of theatre, films, music, and art. In the weekly *Notes on the Way*, to which well-known personalities of the day are invited to contribute, writers are allowed a free pen to discuss any subject they choose. Strongly anti-totalitarian, both in home affairs and foreign policy, *Time and Tide* has been banned in most Communist-ruled countries.

**Timgad**, decayed city of Algeria in the prov. of Constantine, 64 m. S.W. of the tn. of Constantine. It was founded by Trajan about A.D. 100. Extensive Rom. remains have been discovered.

**Timisoara**, see TEMESVAR.

**Timmins**, tn. of Ontario, Canada, 268 m. N. of North Bay on the Temiskaming and N. Ontario Railway, and about 460 m. N. of Toronto. It is the centre of the Porcupine gold-mining area of N. Ontario. About twenty years ago it was only a rough frontier mining vil. but to-day it is a flourishing tn. with all the facilities and amenities of a long-settled city. It has an additional source of future prosperity in the adjoining great clay belt of fertile agric. land estimated at 23,000 sq. m., where settlement has only begun. A feature of the tn. is its large public park created in an area formerly occupied by unsightly mine-dumpings. Besides the large gold mines, there are saw and flour factories, saw mills and planing mills. Pop. 30,000.

**Timoleon** (c. 411-337 B.C.). Gk. democrat, b. of the noblest families of Corinth. His whole life was spent in a ceaseless struggle for liberty, and in his youth this led him to the murder of his own brother Timophanes, who was trying to make himself tyrant of Corinth. In 44 B.C. the Gk. cities of Sicily applied to Corinth for aid against the Carthaginians, and T. was sent with a small force. He took possession of Syracuse, and set about

the estab. of democratic gov. in all the Sicilian colonies. Meanwhile the Carthaginians landed at Lilybaeum (339). T. was not able to collect more than 12,000 men, but with these he marched against the Carthaginian troops and totally defeated them. A treaty was concluded in the next year, and T. continued his work. The flourishing state of Sicily at the time of his death shows how beneficial was his influence. See Holden's ed. of Plutarch's *Life of Timoleon* (1889).

**Timor**, or **Timur**, is. of the Malay Archipelago, largest and most easterly of the Lesser Sunda group. In 1859 a treaty divided the is. between Portugal and Holland, the boundaries being finally arranged by arbitration in 1914. Portuguese T. includes the N.E. of the is. with the Oecussi enclave, and the is. of Pulo Kambing, Dilly (Dilli) being the cap. and chief port. Area 7450 sq. m. Dutch T. comprises most of the S.W., including the is. Rotti, Peman, Savu, Sumba, Allor, and E. Flores, with Kupang as the cap. Area 26,410 sq. m. The soil is dry and not very fertile, and the country mountainous, Mt. Atlas (12,000 ft.) and Mt. Kubalaki (10,000 ft.) being the culminating peaks. Among the chief exports are coffee, cocoa, copra, sandalwood, bêche-de-mer, and cattle. A noted breed of ponies is reared here. Pearls have been found off the S.W. coast. The staple article of food is sago. Pop. (1930), 1,657,000. See H.M. Stationery Office, *Peace Handbook*, No. 80, *Portuguese Timor*, and No. 86, *Dutch Timor*, 1920. Early in 1942 T. was bombed by Jap. raiders, particularly the airfields at Koepang. Later, when the Jap. landed, there was guerrilla warfare. The enemy's move on T. (and Bali) put their bombers within 400 m. of Australia's N. coast, but Australian bombing in 1943-44 averted the danger.

**Timor-Laut**, collection of is. belong to the Malay Archipelago, 265 m. E.N.E. of Timor, belonging to the Dutch. The chief is. are Yandena, Selaru, and Larat. Chief industries are agriculture, cattle-raising, and trepang-fishing. Area of group 2060 sq. m. Pop. 31,800.

**Timoshenko**, **Semjon Konstantinovich**, (b. 1895) Russian marshal b. of peasant stock in the vil. of Furmanka, on the old Russo-Rumanian frontier. After leaving school, where he had but an indifferent education, he worked on the land for twelve years. Called up for military service in 1915 he fought in the First World War. Early in 1918 he was with the Black Sea Partisan detachment, a cavalry force, fighting in the Crimea and against Kaledin's Don Cossacks. He later joined Lodyennyy's First Cavalry Army and became a skilful leader of night attacks, and rose in this army to the rank of general. In 1920 he was in the Russo-Polish campaign and after the defeat near Warsaw he returned to the Crimea where, at Perekop, he was defeated by Gen. Wrangel's troops and severely wounded for the fourth time. He now entered on his real career as a military leader, for at the Frunze Military Academy,

which he entered in 1922, he qualified for high command after long and intensive study both there and at the Military and Political Academy for commanders and commissars which he joined in 1930. T. became military representative at Kiev and Kharkov, stages in his career which had an important bearing on his achievements in the Second World War. It was T. who retrieved the Russian military position in the Russo-Finnish war of 1939-40. When the Gers. invaded Russia, T., who, as Defence Commissar, had reorganised the Red Army and introduced reforms without which successful resistance to the Ger. armies would have been impossible, was entrusted by Stalin with the defence of Moscow. After he had repulsed the Gers., Stalin sent him to stem the enemy's advance in the Ukraine in Nov., 1941. The re-conquest of Rostov on Nov. 26 of that year was due to his masterly tactics and strategy. Despite Russian failures in succeeding months Stalin's confidence in T. never wavered and it was to him he left the command of the general offensive against the Gers.

**Timotheus of Miletus** (c. 446-357 B.C.), Gk. dithyrambic poet and musician. He added an eleventh string to the lyre (or cithara) and thus incurred the displeasure of Athens and Sparta. His poems, on mythological and historical subjects, are daring in treatment and style. His fragments are printed in Bergk's *Poetæ lyrici graeci*.

**Timothy** (d. 97), young friend and fellow-labourer of St. Paul. He was a native of Lystra, his mother Eunice being a Jewess and his father a Gk. He accompanied St. Paul on the second missionary journey, and the lives of the two are henceforward closely connected. He was left as the apostle's representative at Ephesus, where he received two epistles from him. Eusebius says that he met his death there in a popular riot, after denouncing the worship of Diana.

**Timothy, Epistles to**, form with the Epistle to Titus the group known as the Pastoral Epistles, which consist of elaborate instructions for the appointment of officers and the pastoral care of the Christian churches. They show many points of contact with one another and with the other Pauline epistles, but there are numerous departures from the latter both in diction and subject-matter. They are private letters of an official nature. One of the most disputed questions is their authorship. In spite, however, of many attempts to disprove the Pauline authorship, the balance of probability still rests decidedly with the traditional view. The only considerable objection is the difficulty of finding a time and place for these epistles in the recorded life of St. Paul, and it is now usual, therefore, to place them somewhere in the unrecorded portion. The second epistle is, accordingly, placed during a second imprisonment of Paul, of which no record has remained. The pastorals are strongly doctrinal. The Christian life must show no incongruity between creed and practice, and Christianity must be translated into ethical and

spiritual terms. The Christian is to fight a good fight and expect suffering, and his swan song will be a song of victory. Other points are the unity of God; the inspiration of Scripture; and the danger of riches. The modern critical study of the Pastorals began in the early years of the nineteenth century with Schleiermacher, who denied Pauline authorship to 1 Tim. See B. S. Easton, *The Pastoral Epistles*, 1948.

**Timothy Grass**, see CAT'S-TAIL GRASS.

**Timûr Beg**, or **Tamerlane** (1335-1405), sultan of Samarkand, b. at Kesk, of Mongol origin, a direct descendant of Genghis Khan. He assisted and then attacked Husain, Khan of Northern Khorasan and Jagatai, finally supplanting him in 1369. He made Samarkand his cap. and rapidly made himself master of the whole of Turkestan and part of Siberia. He next attacked N.E. Persia. After a series of bloody and cruel conflicts, the whole of Persia, Georgia, Armenia, and the neighbouring states accepted him as suzerain. Timûr then turned his arms towards the N. and overran Kiptshak. He then declared war against India, and in 1398 defeated the Indian army near Delhi. He later came into conflict with Europeans, when he attacked and took Smyrna, the property of the Knights of St. John. He died at Otrâ on the Jaxartes as he was marching to attack China. His name Tamerlane is a European corruption of Timûr-lenk (Timur the Lame). He figures as the hero of Marlowe's (*Sp.*) great drama, *Tamburlaine*.

**Tin**, symbol Sn, atomic number 50, atomic weight 118.7, one of the seven metals of the ancients, occurs as the oxide—tinstone or cassiterite ( $\text{SnO}_2$ )—and is found in Cornwall, Austria, and New S. Wales, but the prin. deposits are in Malaya, the Dutch E. Indies, Bolivia, and Mexico. The metal is prepared from the ore (see CASSITERITE) by roasting to remove arsenic and sulphur, followed by heating in a reverberatory furnace with anthracite. The T. so formed is re-melted and poles of green wood stirred in it. By this means impurities are carried to the surface in the form of a scum. T. is white and lustrous (sp. gr. 7.2), and melts at 232° C. It is crystalline in structure and when bent emits a curious crackling sound called the 'cry of tin.' T. is not acted upon by the air and is therefore used for tinning iron (see TINPLATE). T. readily dissolves in hydrochloric acid with evolution of hydrogen and the formation of stannous chloride ( $\text{SnCl}_2$ ). It is not acted upon by dilute sulphuric acid but dissolves in the concentrated acid. Stannic oxide is formed in the hydrated condition (as in stannic acid ( $\text{SnO}_2 \cdot \text{H}_2\text{O}$ )), by the action of nitric acid on the metal, while aqua regia acting on the metal forms the tetrachloride ( $\text{SnCl}_4$ ). T. forms two series of salts, the stannous, in which it is bivalent, and the stannic salts, in which it is quadrivalent. The stannic salts correspond with similar compounds of carbon and silicon, the oxide ( $\text{SnO}_2$ ) is acidic, and the chloride is a fuming liquid. The stannous salts are strong reducing agents. The



oxide (SnO) is basic but also acts as an acid-forming oxide towards strong bases. The alloys of T. are of great value, comprising gun metal (Cu and 8-14 per cent. Sn), bronze (copper and tin), phosphor bronze (1 per cent. phosphorus), pewter (Sn 80, Pb 20), solder, bell metal, as well as a large number of alloys with other metals such as gold, iron, bismuth, etc. One of the best-known compounds of T. is pink salt,  $\text{SnCl}_2 \cdot 2\text{NH}_4\text{Cl}$ , which is used as a mordant in dyeing.

**Tincobrai**, tn. in the dept. of Orne, N.W. France. T. was the scene of a battle between Robert of Normandy and his brother, Henry I. of England, in 1106, after which Normandy was annexed to the Brit. crown. Pop. 3300.

**Tincture**, in heraldry, the colour of the field and charges of an escutcheon. See HERALDRY.

**Tindal, Matthew** (c. 1656-1733), Eng. deist, b. at Bere Ferrers, Devon, and educated at Lincoln College, Oxford, becoming fellow of All Souls (1678). After having joined the Church of Rome (1685), he returned to the Church of England (1688), and later wrote controversial pamphlets, which all met with vehement opposition from the High Church party. He aroused fierce controversy in 1796 with the pub. *The Rights of The Christian Church Against all Romish and Other Priests* (1706). But his famous work was his *Christianity as Old as the Creation* (1730), popularly known as 'The Deist's Bible,' which had for its purpose the 'stripping of religion of the additions which policy, mistakes and the circumstances of the times have made to it.' See E. Curll's *Memoirs*, 1734; J. Hunt, *Religious Thought in England*, ii, 431 (1896).

**Tindale, William**, see TYNDALE.

**Tinfoil**, see FOIL.

**Tinned Meat**, see under CANNING.

**Tinneveli**, chief tn. of the dist. of the same name, Madras, India. Headquarters of Protestant missions, and is famous for its temple to Siva. Area of dist. 4342 sq. m. Pop. 2,250,000. Pop of tn. 60,700.

**Tin-plates and Sheets**, basis of low-carbon unalloyed mild-steel coated by hot-dipping or electro-deposition with pure tin. It is used chiefly for the manuf. of cans and boxes.

**Tintagel**, coastal vil.  $4\frac{1}{2}$  m. from Camel-ford and 20 m. from Launceston in Cornwall, England. It is a popular holiday resort and has sev. good bathing beaches, and golf courses. Near by is T. Head, a promontory 300 ft. high, on the Atlantic Coast, with the ruins of a castle famous in the Arthurian Romances. Some affirm that King Arthur was born here. In other versions, it is the impregnable and inaccessible retreat of King Mark. That a castle did exist here in pre-Saxon times seems certain, though the present ruins are mostly of a later, Norman structure. Pop. 1400.

**Tinta Wine**, see under MADEIRA WINE.

**Tintern Abbey**, famous ruins of Tintern wll. in the co. of Monmouthshire, Eng., beautifully situated on the Wyfe, 5 m. N. of Chepstow. They date from 1131, when

Walter de Clare founded a Cistercian house which became one of the wealthiest foundations in England. The magnificent building was mainly erected between 1269-87 by Roger Bigod, earl of Norfolk. The chief remains are the ruins of the magnificent cruciform church, the chapter house, and refectory. In 1900 the duke of Beaufort, whose family had long held the property, presented it to the nation; since when extensive repairs have been effected.

**Tintoretto, Jacopo Robusti** (1512-94), chief painter of the later Venetian school, b. at Venice. He studied under Titian, and was considerably influenced by Michelangelo. His paintings show never-failing imagination, broad and dramatic composition, fine draughtsmanship, and a superb use of colour. T. was an untiring worker, and his great output was probably responsible for some strangely uneven work. Among his numerous works are 'St. George Destroying the Dragon,' 'Christ Washing the Feet of the Disciples' (both in the National Gallery), 'The Miracle of St. Mark,' 'The Crucifixion,' and 'The Marriage at Cana.' Perhaps no writer has shown better appreciation of T. than Ruskin, who rescued him from obscurity (*Stones of Venice*, etc.). See also lives and studies by F. P. Stearns, 1901; E. M. Phillips, 1911; L. Coletti, 1914; and H. Tietze, 1919.

**Tipperah**, dist. of E. Bengal, Pakistan, on the edge of the Ganges delta. Area 2499 sq. m. It exports large quantities of rice and jute. Cap. Comilla. Pop. 3,860,000.

**Tipperary**: (1) Inland co. in the prov. of Munster, Eire, bounded by Galway and Offaly (King's co.) in the N., Cork and Waterford to the S., Leix (Queen's co.) and Kilkenny to the E., and Clare and Limerick on the W. To the N. and W. lies a mountainous region with Keeper Hill (2278 ft.) and in the S. are the Galtee Mts., with Galtymore (3015 ft.), the Knockmealdown Mts., and farther E. the Slieveardagh Hills. The Bog of Allen adjoins Kilkenny, while in the S.W. lies the Golden Vale, one of the most fertile regions in all Ireland. The prin. rivs. are the Shannon in the N.W. with Little Brosn., and Nenagh, the Suir and the Nore in the centre, and S. Lough Derg, the N.W. boundary, is the only lake of any size. Agriculture is the chief industry, barley and oats are the main crops, potatoes and turnips also grown; a considerable area is under pasture, and cattle are reared in large numbers. Dairy farming flourishes and there are a number of butter factories. There are also flour and meal mills. Coal, copper, lead, and zinc are found, also slate and limestone, but mining is very little carried on. The co. is divided into a N. and S. riding, and returns seven members to the Dail Eireann. There are interesting remains of castles and eccles. buildings in various parts of the county, notably at Cashel, where there is a round tower, at Ardflinnan, at Athassel (an Augustinian priory), at Holycross (Cistercian abbey), and at Felthard and Roscrea (abbeys). The co.

is one of those supposed to have been made by King John in 1210. It was granted to the earls of Ormonde in 1328, and was the last of the Irish palatine cos. In 1848 it was the scene of the Young Ireland rising, an abortive rebellion. The co. tn. is Clonmel (8889), other tns. are Tipperary, Carrick-on-Suir, Nenagh, Thurles, and Cashel. The area is 1659 sq. in. Pop. 137,000, decreased through emigration. (2) Mkt. tn., co. Tipperary, Eire, 23 m. S.E. of Limerick, at the foot of the Shevenamuck Hills. In the fertile plain known as the Golden Vale, it is famous for its butter making, and there is also a condensed milk factory. Four m. from the tn. is the Glen of Aherlow, and just outside the tn. is New Tipperary, the vil. built by Wm. O'Brien in 1890, for the Smith-Barry tenants who had to give up their holdings on account of the boycott. Pop. 5300.

**Tippoo Sahib**, see TIPU.

**Tipstaff**, officer of the High Court whose function it is to arrest within the precincts of the Court and take to prison any person committed by the Court. The name is often extended to any constable, sheriff's officer, and court crier or usher, and is connected with the staff tipped with metal or a small crown which was formerly his badge of office.

**Tipton**, tn. of Staffordshire. It is engaged in light and heavy engineering, iron founding, and the manuf. of motor-car parts, grates, furniture, glassware, hollow-ware, clothing, light metal goods, electrical equipment, machine tools, etc. Its par. registers, beginning in 1513, are the oldest in England. Pop. 39,300.

**Tiptree**, vil. in Essex, England, 16 m. from London on a light railway running from Kelvedon. It is noted for fruit and seed growing, and for its jam factory.

**Tipu**, or **Tippoo Sahib** (1749-99), son of Hyder Ali, succeeded his father as Sultan of Mysore in 1782. He had previously distinguished himself in the Mahratta war, 1775-79, and in the first Mysore war had defeated Brathwaite in 1782. As sultan he concluded a treaty with the Brit. in 1784, but in spite of this invaded (1789) the protected state of Travancore. War followed, and in 1792 he was obliged to resign half of his dominions. But nothing daunted, he continued his intrigues, urging the Fr. to stir up war with England, the result of which was the storming of his cap., Seringapatam, by the Eng., during which T. himself was killed. See L. B. Bowring, *Hydar Ali and Tipu Sultan*, 1893.

**Tipulidæ**, see CRANE FLY.

**Tirana**, cap. of Albania, 20 m. inland above the Rushka valley. It dates from the seventeenth century and is noted for its mosques. The tn. was much damaged during the Second World War. It gives its name to a prefecture with a pop. of 57,800. Pop. 31,000.

**Tiree**, or **Tyre**, is of the inner Hebrides, Argyllshire, Scotland. Hynish in the S. has a watch tower built for signalling to men on duty at Skerryvore lighthouse. The is. is very flat, and has been used as a landing ground for aircraft. Pop. 1700.

**Tiridates**, name of a dynasty of Parthian or Armenian kings, five of whom are remembered. The two most important are Tiridates I. and II. *Tiridates I.* conquered his kingdom with the assistance of his brother, Vologresius. But the Rom. gen., Corbulo, from whom he had taken it, forced him to turn to Nero for assistance, whose suzerainty and paramount authority Tiridates was compelled to acknowledge. *Tiridates II.*, who was the son of Kosron, was educated at Rome, and won the friendship of the Roms. by his military qualities. At the request of Lichinus, Diocletian restored him to the throne of Armenia in 286. He was welcomed with enthusiasm by his people, anxious to be freed from the yoke of the Persians. Fortune, however, did not favour Tiridates long, for the Persians soon robbed him again of some of his richest prov. In 296, however, the Roms. replaced him on his throne. He embraced the Christian faith before his death in 314.

**Tirlemont**, see TIENEN.

**Tirnova**, see TRNOVA.

**Tiro**, Marcus Tullius, freedman of Cicero, and his amanuensis and assistant in literary labours. He was himself an author of no mean reputation, and notices of his works have been preserved by anc. writers. He was the first recorded person to invent a system of Lat. shorthand.

**Tirol**, see TYROL.

**Tirpitz**, Alfred Peter Friedrich von (1849-1930), (Ger. grand-admiral; b. at Kustrin, son of one 'Gross-Justiz-Rat' T., of a Prussian landowning family. Attended the Realschule at Frankfurt-on-the-Main. Passed into the Prussian Navy in 1865, and for thirty years was almost continuously at sea. In the eighteen-seventies, T., a lieutenant-commander, prepared memoranda on torpedoes, which led to the estab. of a torpedo-section in 1885. In 1892 he was appointed to the naval staff at Berlin. Rear-admiral, 1895, in 1896, he was appointed to command the Asiatic Cruiser Squadron; under his direction Tsingtau became a Ger. naval base. On returning home in 1897 he became secretary of state for the navy. In 1898 he presented to the Reichstag his first Navy Bill, the beginning of the serious growth of the Ger. Navy. Vice-admiral, 1899. His second Bill was brought in in 1900; it definitely started the naval-arms-race. Admiral, 1903. Grand-admiral, 1911. At the beginning of the First World War he was still secretary of state for the navy; but he was on bad terms with his two naval colleagues, and did not succeed in his purpose of making full use of the navy from the beginning. He resigned March 15, 1916, and was Nationalist member of the Reichstag from 1924 to 1928, and then retired to private life. He wrote *My Memoirs* (1919); also *Der Aufbau der deutschen Weltmacht* (1924).

**'Tirpitz'**, Ger. battleship, see UNDER NAVAL OPERATIONS IN SECOND WORLD WAR, *Naval Operations*, 1944.

**Tirso de Molina** (alias Gabriel Tellez) (1585-1648), Sp. dramatist, b. in Madrid

educated at the Univ. of Alcalá de Hénarés. When he had taken his degree he left for Madrid, in order to take up the life of a dramatist. Molina, or Tellez, as he is more generally known, was a very prolific writer, and wrote three hundred comedies, which, taking into consideration the length of his creative period, works out at the rate of two plays a month. Tellez ended his life as a member of a religious order, and became prior of the monastery of Soria, where he died at the age of sixty-three. Among his best-known plays is *Don Juan*, to which Molière was indebted. See life by A. H. Bu-see, 1939.

**Tirupati**, tn. of Madras, India, in the dist. of N Arcot, 72 m. N.W. of Madras. It is celebrated as a place of pilgrimage, and has a wonderful hill-temple. Pop. 19,500.

**Tiryns**, anct. tn. in Argolis, said to have been founded by Proetus, who built the massive walls of the city with the help of the Cyclopes. Proetus was succeeded by Perseus, and it was here that Hercules was brought up. The remains of the city including the ruins of two palaces dating from about 1600 B.C., are some of the most interesting in all Greece.

**Tischendorf, Lobegott Friedrich Konstantin von** (1815-71) Ger. biblical scholar, b. at Legenfeld in Saxony. He made a special study of N. T. criticism at the Univ. of Leipzig, and in 1845 became prof. there. He discovered the fourth-century Smaitic Codex (see *SINAITICUS*, CODEX), at the monastery on Mt. Sinai. His works include: eds. of the Smaitic Codex (1862-63); *Editio VIII.* of the New Testament (1864-72); the *Monumenta Sacra Inedita* (1846-71); and *Reise in den Orient* (1846); *Aus dem Heiligen Lande* (1862), which describe his journeys.

**Tishri**, seventh month of the anct. Biblical (the name T. is post-biblical) calendar, and first month of the Jewish post-exilic calendar, corresponding to Sept.-Oct. On the first day is the feast of the New Year (Rosh Hashanah, *q.v.*); on the 10th the Day of Atonement (Yom ha-Kippurim, *q.v.*); on the 15th the harvest festival or feast of Tabernacles.

**Tisio da Garofalo**, see *BENVENUTO*.

**Tisiphone**, see under *ERUMINENTES*.

**Tisserand, François-Félix** (1845-96), Fr. astronomer, was appointed as *astronome adjoint* to the Paris Observatory in 1863 and as director in 1892. In addition to his observational work he conducted important researches in mathematical astronomy, many of the results of which appeared in *Comptes Rendus*. In *Bulletin Astronomique* (1899), he dealt with the theory of the capture of comets by the larger planets and pub. his well-known *Criterion* for establishing the identity of a periodic comet, in spite of its perturbations by the planets. This also appeared in his chief work, *Traité de Mécanique céleste* and is expressed as follows;  

$$\frac{1}{a} + 2\sqrt{a(1-e^2)} \cos i$$
 is constant, where  $a$  is the semi-major axis of the ellipse in which the comet moves,  $e$  its eccentricity

and  $i$  the inclination of its orbit to the plane of the ecliptic.

**Tissue and Tissue Culture**. T. (Lat. *texere*, to weave) in general usage denotes either an interwoven fabric, or a connected series of statements, circumstances, or events. Biologically, a T. consists of associated cells having in common either form, function, both form and function, or other characteristics. In animals there is frequently dead, non-cellular matrix deposited between the cells, as for instance in bone and cartilage. The study of T.s is *histology*. Ts. may be named severally according to the types of cells composing them, e.g. muscular and nervous Ts. of animals, and parenchymatous, prosenchymatous, and sclerenchymatous Ts. of plants; or according to their function, e.g. connective Ts. of animals, vascular and storage Ts. of plants; or according to their position, e.g. epithelial tissue of animals and dermal Ts., such as cork and bark, of plants. See further under *AMORPH*; *CELL*; *EMBRYOLOGY*; *EPITHELIUM*; *EXPERIMENTAL EMBRYOLOGY*; *HISTOLOGY*; *LYMPH* and *LYMPHATICS*.

**Tisza of Boros-Jenő and Szeged, Istvyán (Stephan) Emmerich Ludwig Paul, Count** (1861-1918), Hungarian statesman; b. April 22, at Budapest; son of Kálmán Tisza. He entered the Hungarian Chamber, 1886. He was Prime Minister from 1903 to 1905 and had himself elected President of the Chamber in 1912, forcing the Army Bill through. On June 15, 1913, T. again became Premier. He was adamant in his attitude to minority peoples within the ters. of the Dual Monarchy, so that he hopelessly estranged Rumanian feeling. On the death of the Emperor Francis-Joseph, 1916, T.'s influence began to wane. The Emperor Charles favoured a thorough review of the problem of the Slav. pops., and also a democratisation of the franchise. T. objected to both these reforms, resigned May 1917, and was assassinated in the following year. On his policy, especially during the closing months of his life, see E. von Glaise-Horstenau, *The Collapse of the Austro-Hungarian Empire*, 1930. See also life by F. Herczeg, 1926; O. Jászai, *The Dissolution of the Hapsburg Monarchy*, 1921, and L. Lanyi, *Le comte Étienne Tisza et la Guerre de 1914-1918*, 1946.

**Tisza**, see *TREISS*.

**Tit**, or **Titmouse**, names given to members of the passerine family Paridae. Five species, all great insect-eaters, are common in Britain, and two occur in a few dists.: one of these is the bearded T. or reed pheasant (*Parus biarmicus*), which is found only in Norfolk and Yorkshire; the male is about 6 in. long, and has a thin tuft of black feathers on each side of the chin; the general colour is light red. The crested T. (*Parus cristatus*) occurs only in parts of Scotland, though it sometimes visits England. The blue T. (*P. ceruleus*) is the commonest of these birds; its prevailing colour is blue, with green above, and a black throat. The coal T. (*P. ater*) has a black head, with a white patch on the nape. The great T. (*P. major*) is about 6 in. long and is yellow on the back,

breast, and sides, with grey wings and tail, and black head and throat. The marsh T. (*P. palustris*) resembles the coal T. except for the latter's white nape and white spots on the wings. The long-tailed T. (*Acridula caudata*) is about 5½ in. long, and has the black tail feathers prolonged and graduated. The black-cap T. or chickadee (*g.v.*) (*Parus atricapillus*) is a N. Amer. native.

**Titan**, satellite of Saturn. Mean distance from primary 759,500 m., periodic time, 15 days, 22 hrs., 4 min. Stellar magnitude at mean opposition distance, 8.3.

**Titania**, satellite of Uranus. Mean distance from primary 272,500 m. Its period of sidereal revolution is 8 days, 16 hrs., 56 min. Stellar magnitude at mean opposite distance, 14.

**Titania**, see MAB. QUEEN.

**'Titanic' Disaster** was caused by the White Star liner *Titanic* colliding with an iceberg on the night of April 14, 1912. In all, close on 1,500 persons were drowned, among them being Colonel J. J. Astor, Jacques Futelle, the Amer. novelist and dramatist, F. D. Millet, the artist, William T. Stead, editor and journalist, and Harry Widener, millionaire book-collector. Out of 2201 passengers, only 711 were saved, being picked up by the *Carthage* after a wireless message from the *T.* The *T.*, then the largest vessel afloat (tonnage about 45,000), was on its maiden voyage to New York, and shortly before midnight of the third day of the trip, when in lat. 41° 26' N., and long. 50° 14' W., struck an enormous iceberg a glancing blow, stripping off her bulge practically from end to end. Less than three hours from the impact the liner sank. After an enquiry the Mersey Report was issued as a result of which improvements were introduced in life-saving equipment, and boat-drill for passengers became a necessary routine. See L. H. Bessley, *The Sinking of the Titanic*, 1912; and Commodore Sir A. Rostron, *Home from the Sea*, 1931.

**Titanium**, metallic chemical element, symbol Ti, atomic weight 47.9, atomic number 22. It occurs in nature as the oxide which exists as the polymorphic varieties, anatase, rutile, and brookite. The metal is white and lustrous (sp. gr. 4.5), and is obtained by the electrolysis of a solution of the oxide in calcium chloride, or, better, by heating titanium tetrachloride with metallic sodium in the absence of air. T. unites directly with nitrogen to form a nitride having a metallic lustre. Like silicon dioxide, T. dioxide is the anhydride of a weak acid, but it also exhibits feebly basic properties. In its halogen compounds T. is quadrivalent and hexavalent. Though T. is a comparatively abundant element, few uses have been discovered for it or its compounds. T. is employed in the manufacture of various alloys; T. tetrachloride is used in making smoke-screens for naval purposes, and other compounds are used as pigments, chemical reagents, etc. T. chloride finds some use in volumetric analysis.

**Titans**, sons and daughters of Uranus (Heaven) and Gea (Earth). They were

twelve in number, six sons and six daughters. It is said that Uranus, the first ruler of the world, threw his sons into Tartarus. Gea, indignant at this, persuaded the Titans to rise against their father. The Titans then deposed Uranus, liberated their brothers who had been cast into Tartarus, and raised Cronus to the throne. It having been foretold to him by Gea and Uranus that he should be dethroned by one of his own children, he swallowed his children successively. Rhea, therefore, went to Crete, and gave birth to Zeus in the Dictæan Cave. When Zeus had grown up he availed himself of the assistance of Thetis, who gave to Cronus a potion which caused him to bring up the children he had swallowed. United with his brothers and sisters, Zeus now began the contest against Cronus and the ruling Titans. This contest lasted ten years, till at length Gea promised victory to Zeus if he would deliver the Cyclopes and Hecatoncheires from Tartarus. Zeus accordingly slew Campe, who guarded the Cyclopes, and the latter furnished him with thunder and lightning. The Titans were then overcome, and hurled down into a cavity below Tartarus.

**Titchener, Edward Bradford** (1867-1927), Eng. experimental psychologist, was b. at Chichester. Graduating from Oxford Univ., he then went to Leipzig for his Ph.D. degree. He graduated in 1892, and was at once called to Cornell Univ. in the U.S.A., where one of the first experimental psychological laboratories in America had been founded. He remained there for the rest of his life, and became one of the recognised world authorities on his subject. His big two-volume work *Experimental Psychology, a Manual of Laboratory Practice* (1927), is the masterpiece on the subject so far as Eng.-reading people are concerned. In this exhaustive treatise he considered both qualitative and quantitative experimental work.

**Tithe**. Ts. were 'the tenth part of the increase yearly arising from the profits of lands, stocks upon lands, and the industry of the parishioners, payable for the maintenance of the par. priest, by everyone who has things fitheable, if he cannot show a special exemption' (Thomas Wood's *Institute of the Laws of England*). Ts. were payable before the Christian era (see Gen. xiv. 20), but in the Christian Church Ts. were first given by the faithful as spontaneous offerings, at the solicitations of the clergy. Such voluntary offerings were given in kind, e.g. wool, corn, or other agric. or farm produce. Canon law (*g.v.*) later enjoined payment as a legal obligation in accordance with the divine law of the O.T. (see TERINDS). Ts. were either *predial*, *personal*, or *mixed*: *predial* being the produce of the soil (e.g. corn, wood); *personal*, the produce of labour and industry; and *mixed*, the produce of animals, also including eggs. Prior to the decrees of the Lateran Council (1215), it was a common practice to pay T. to monasteries, but the Council restricted tithe-payers to payment to the parsons of pars. In consequence most Ts.

belonged as of common right to the par. incumbents, though sometimes laymen could show a right to a portion of Ts., based upon a prior voluntary grant to some spiritual corporation. Again, recortorial Ts., after the dissolution of the monasteries, frequently found their way into lay hands (see *IMPROPRIATION*). The only lands exempt from Ts. were barren heath, waste forest or glebe, old monastic lands held prior to the dissolution exempt from Ts., crown lands or lands held by a spiritual corporation, which had never been known to pay Ts., and lands in respect of which was payable a modus or composition real: it was an agreement between parson ordinary and landowners and patron, whereby the landowners agreed to pay a perpetual sum in lieu of T.). The Tithe Commutation Act, 1836, and amending Acts commuted all the Ts. of England and Wales into T. rentcharge and fixed the total amount of the rentcharge for which the Ts. of each par. were to be commuted.

Provision was made by the Tithe Act, 1818, for the compulsory redemption of rent charges exceeding 20s., the consideration money for redemption being the amount agreed between the owners of the land and of the rentcharge. Provision for apportionment of annuities created by the redemption of T. rentcharge was made by an Act passed in 1921. The Tithe Act, 1925, still further amended the law on T. rentcharges, rents, etc., in lieu of T., and the payment of rates on rentcharge, etc. By this Act any T. rentcharge which before March 31, 1927, was attached to a benefice or to an eccles. corporation was transferred to be vested in the Governors of Queen Anne's Bounty and held in trust for the incumbent or corporation.

Notwithstanding much legislation rentcharge gave rise to agitation and remained a vexed question which was only settled by another Act, the T. Act of 1936, which at last ended a system containing ineradicable difficulties. This Act extinguishes both rentcharge and extraordinary rentcharge, and makes provision through a Tithe Redemption Commission for compulsory redemption and for the compensation of persons interested, by the issue of 'redemption stock' charged on the Consolidated Fund. In other words, the rentcharge, which was previously payable to the Church, the Eccles. Commissioners, Queen Anne's Bounty, and some lay owners, is replaced by 'redemption annuities' payable to the Crown, and the Crown issued gov. stock to the tithe-owners. Thus for the first time in its long hist. T. was divorced from the Church. The annuities will be payable until 1996 when they should cease and all T. (with a few minor exceptions such as corn rent) will be abolished. A capital loss estimated at £17,750,000 resulted to the Church of England from the Act of 1936, a situation which called for every possible adjustment by the Eccles. Commissioners and Queen Anne's Bounty (now amalgamated as the Church Commissioners). See P. W. Millard, *Tithes and Variable Rentcharges: Some Aspects*

*of their History and Development*, 1934, and *Law Relating to Tithes and Payments in lieu of Tithe* (3rd ed.), 1938.

**Tithing**: (1) In A.-S. police arrangements, associations of ten men (in the N. of England called the *tenmannetale*: elsewhere *frithborh* or *frankpledge*) who, dwelling near each other, were sureties or free pledges to the king for each other's good behaviour. The name and div. of T. itself still remains in parts of the country. (2) Levying a tax on or to the amount of a tenth. See *TITHE*.

**Titian**, or **Tiziano Vecelli** (c. 1477-1576), It. painter of the Venetian school, *b.* at Pieve, in Cadore, a mountainous dist. of the Venetian Alps. Having shown a taste for art, he was sent to Venice to learn painting, and first studied under Zuccati, a mosaicist, afterwards becoming the pupil of Bellini and Giorgione. He seems first to have been employed in the decoration of houses, but he also produced works on canvas, notably the allegorical picture 'Sacred and Profane Love,' 'Doge Marcello' (at the Vatican), and 'Christ and the Pharisee—Tribute Money,' of the Dresden Gallery, spoken of by Vasari as something stupendous and miraculous. In 1516 he was made official painter to the council in Venice. In the same year he went to Ferrara, and executed amongst other works the 'Bacchus and Ariadne,' now in the National Gallery. In 1533 he became acquainted with the Emperor Charles V., who sat to T. for his portrait, rewarding him by making him a Count Palatine and a Knight of the Golden Spur. Returning from Bologna to Venice (1537) he executed his magnificent 'Battle of Cadore,' which unfortunately perished by fire in 1577, but he was again with the emperor at Milan in 1541, and in 1545 accepted the pope's invitation to Rome, where he painted portraits, as well as 'Danaë,' now in the Naples Museum. In 1548 he undertook a journey across the Alps to join Charles V. at Augsburg, and painted the well-known portraits of Philip of Spain. From this time he was chiefly occupied in working at Venice, until in 1576 he died of the plague. T.'s works are remarkable for their magnificent colouring and technical skill. He painted religious pictures as well as mythological, poetical, and allegorical subjects, and as a portrait painter he occupies the first rank. See J. A. Crowe and G. B. Cavallo, *Life and Times of Titian*, 1887; C. Phillips, *Titian: a Study of his Life and Work*, 1898; C. Huetts, *Titian*, 1910; D. von Haden, *The Drawings of Titian*, 1927; R. F. Heath, *Titian*, 1930.

**Titicaca Lake**, mt. lake in the Andes, on the frontier of Bolivia and Peru in S. America, between the main Andean range and the Cordillera Real. It is 120 m. long, has an average width of 30 m., and lies 12,545 ft. above the sea. Its area is 3200 sq. m., and its maximum depth is about 700 ft. The water is fresh but unpleasant.

**Tit-lark**, see *PITR*.

**Titles**, additions to a person's name, indicative of some honour, office, or

dignity, e.g. emperor, prince, chancellor, primate, duke, mayor. Some T. are held *virtute officii*, as for instance 'king'; others, like the T. of the five orders of nobility, and baronets in Britain, are hereditary, and some, like that of knight, are conferred for life. See also ADDRESS, FORMS OF; NAMES; NOBILITY.

**Titmouse**, see BLACK-CAPPED TOMTIT.

**Titto, Broz Josip** (b. 1890), Yugoslav soldier and statesman, b. at Kumrovec nr. Zagreb. He came of peasant stock, and worked as a farm-labourer for a time. After the First World War he became a Communist, paying frequent visits to Moscow for training periods there and adjustment to the ever-changing Party line. He married a Russian intellectual, who later disappeared in a Moscow purge of Trotskyists. In the winter of 1928-29 he was arrested in Zagreb. After a short time in the Zagreb prison T. returned to Moscow and attended the Lenin school for two years. In 1934 he became a member of the Yugoslav Politburo and here he began his secret struggle to oust Stalin's satellite, Milan Gorkić who had been sent

Communist leaders of Europe who remained safely in Moscow during the war, T. was in his own country organising resistance to the Nazis. His fight was fraught with the greatest difficulties for his antagonists included, besides the Nazis, the Mihailovich (q.v.) partisans and the N.K.V.D. observers in his own Politburo. By velding the peasants into a victorious guerrilla partisan army he felt he had contributed not only a new Communist experience, but something novel in Stalinist doctrine. When the Cominform (q.v.) headquarters were estab. in his cap., Belgrade, T. had a valuable opportunity both to receive regular reports from Moscow on the latest developments in the Russian party, and also to pass on his interpretation of such reports to those delegates he wanted to influence. He now no longer stopped at sparring with Russian supervisors in Belgrade in order to keep control of the Yugoslav Party, but actively intervened in the Party struggle in Moscow and, as a consequence, he came into a life-or-death struggle with Andrei Zhdanov (q.v.). In mid-1948 the Cominform expelled T. and urged the Yugoslav people to turn him out of office if he did not change his policy. Yet a year later T. was still in power in spite of all that the Cominform had been able to do, though there can be no doubt that the quarrel with Soviet Russia had by that time made serious political and economical difficulties for Yugoslavia; but equally there seems to be no doubt that T. was still genuinely popular with supporters from all classes of the people and all parts of the country, for the idea that Moscow should try to control Yugoslav internal affairs, or limit her industrial expansion roused their national pride and rallied them round T. As a consequence of this quarrel the Cominform countries decided to impose economic sanctions and therefore stopped sending to Yugoslavia any cap. equipment, hoping that unemployment and food shortage would eventually bring about wholesale collapse of Yugoslav economy; but T., adhering to his five-year-plan, made trade treaties with over a score of countries, many of them in W. Europe. See also EASTERN FRONT IN SECOND WORLD WAR.—*New Russian Attacks in Rumania, etc.*: YUGOSLAVIA. See G. Bilainkin. *Titto*, 1949.

**Titograd**, see PODGORITZA.

**Titration**, method in quantitative chemical analysis. The weight of a substance in a definite volume of solution is determined by causing it to react with a solution of another reagent of known strength. This reagent is contained in a burette and run out into the other solution till reaction is complete, as shown by change of colour of an indicator such as litmus, methyl-orange, phenolphthalein, or by cessation of effervescence, etc. The volume used is noted and the weight of reagent contained is thus known. From the chemical equation and the atomic weights, the weight of the other solute can then be calculated. T. methods are quick and, under suitable conditions, are susceptible of great accuracy; they have



Yugoslav Embassy

MARSHAL TITO

to Belgrade in 1928 to bind the Yugoslav Party to the Soviet general secretariat. After three years of conspiracy T. achieved his first success; Gorkić paid the usual price of failure, was called to Moscow in 1937, and executed. Installed with unlimited power, as the general secretary of the Yugoslav Party T. dissolved it and ordered a re-registration. Surrounded by loyal adherents T. now began to aspire to higher things. Unlike most of the other

therefore largely displaced the older gravimetric methods, though these are still employed when even greater accuracy is required. T. was introduced by Gay-Lussac (*q.v.*) early in the nineteenth century.

**Titulescu, Nicolas** (1883-1941), Rumanian lawyer and statesman, became prof. of law at Jassy Univ. (1905) and at Bucharest Univ. (1909). He entered Parliament in 1912 as a supporter of Také Jonescu (*q.v.*) and as a recognised authority on finance. In the First World War he was finance minister from 1916 until the treaty of Bucharest, when he resigned. In his term of office he supported the scheme of land reform involving div. of the large estates, whereby he probably saved his country from Bolshevism. He took a prominent part in negotiating the agreements with Czechoslovakia and Yugoslavia which constituted the Little Entente (*q.v.*). His policy of a Balkan bloc led to the signing of the Balkan Pact of Feb. 1934. His foreign policy envisaged friendship with France, accommodation with Russia, and regional pacts in the Balkans, the objective always being the integrity of Greater Rumania. In 1936 he was ousted from the gov.

**Titus**, friend and companion of St. Paul, not named in the Acts. All we know of him is learned from the letters of the apostle. He was left by the latter as bishop of Crete, and there he received the epistle which bears his name. Eusebius says that he remained unmarried and *d.* in old age. See B. S. Eason, *The Pastoral Epistles*, 1948.

**Titus T. Flavius Sabinus Vespasianus** (A.D. 40-81), Rom. emperor, son of Vespasian. He won early distinction as military tribune in Britain and Germany, and helped to crush a Jewish insurrection (67), besieging and storming Jerusalem (69-70). T. was associated with Vespasian in the gov. (71), and succeeded him (79), proving a wise and kind ruler.

Under T. began the campaigns of Agricola in Britain. Two heavy calamities fell upon Italy during his reign: the eruption of Vesuvius, burying Pompeii, Herculaneum, and Stabiae (24 Aug., 79), and, a few months later a great fire in Rome. See Suetonius, *Titus*; Tacitus, *Hist.*; Josephus, *History of the Jewish War*; C. E. Boulé, *Titus et sa Dynastie*, 1872.

**Titus** (Τίτιος), giant of Euboea, son of Gaea, or of Zeus and Elara. For offering violence to Artemis (or in other accounts to Leto) he was killed by Zeus or Apollo and then cast into Tartarus, where two vultures perpetually devoured his liver as he lay outstretched on the ground.

**Timen**, or **Tyumen**, tn. in the Omsk Region of the R.S.F.S.R., 125 m. S.W. of Tobolsk. Rivercraft are built here for the Ob-Irtysk transport system of Russia. It has tanneries, silk mills, iron foundries, machine works, etc. Pop. 75,500.

**Tiverton**, municipal bor. of Devonshire, England, on the Exe, 14 m. N.N.E. of Exeter. The chief building of interest is the church of St. Peter. Textile manuf. is the chief industry. Blundell's

School was originally built at T. in 1604; the present buildings were erected outside the tn. in 1882. Pop. 11,200.

**Tivoli** (anct. **Tibur**), anct. tn. 25 m. by railway E.N.E. of Rome, on the Teverone (anct. **Anio**), in Italy. Before Rome was built the Lat. city of **Tibur** *fl.* In Horace's day it was the favourite summer resort of wealthy Romans, and ruins of Hadrian's and Maecenas's villas, besides mausolea, aqueducts, and a circular temple, are still to be seen. Its situation at an altitude of nearly 800 ft. in the Sabine Hills makes it both picturesque and healthy. Apart from classical remains, the Renaissance garden of the Villa d'Este (begun in 1549) excites much interest. Beautiful falls on the riv. supply Rome with electric power. In the battles of 1941, the fine buildings of T. sustained considerable damage, especially the churches, though the cathedral lost only its window glass. A direct hit badly damaged the Chiesa del Gesù. S. Filippo was completely destroyed. A direct hit demolished the whole upper storey of the Villa d'Este, on one side of the courtyard, but the hanging gardens with their famous fountains were relatively undamaged. Pop. 16,000.

**Tlacolula**, tn. in the State of Oaxaca, Mexico, dating from about 1250 and an important mkt. centre. Its sixteenth-century church has a beautiful chapel decorated in the baroque style of Santo Domingo in the city of Oaxaca (*q.v.*). Pop. 12,000.

**Tlaxcala**, inland state of Mexico and its cap. The State, which has an area of 1555 sq. m., lies on the Mexican plateau, average height 7000 ft., rising in Malinche to 13,454 ft. In the days of the great Aztec empire, T. maintained a sturdy independence within her mt. fastnesses till, in 1519, she became the ally of the Spaniards under Cortés. The cap. lies 18 m. N. of Puebla. Pop. state 224,000; tn. 3000.

**Tlemcen**, tn. in the dept. of Oran, Algeria. The Rom. **Pomaria**, it was later the Moorish cap. It fell to the Fr. in 1842. It has synagogues, mosques, and a museum of antiquities. It exports blankets, olive oil, and alfa, and manufs. leather work and native carpets. Rashgun, which has a lighthouse, is its port. Pop. 54,300.

**Toad**, the name usually applied to members of the large genus *Bufo* of batrachians. They differ from frogs chiefly by the total absence of teeth, and in certain anatomical features, such as the shoulder girdle and the sacral vertebra. In Brit. Ts. a large poison-secreting gland, called the *parotid*, occurs, but this is absent from the frogs. It appears to be necessary for the poison to come into contact with the blood through an abrasion or other means to be noxious. The skin of the T. is drier and more warty than that of the frog. The two Brit. Ts. are the natterjack (*Bufo calamita*) and the common T. (*Bufo vulgaris*), which is generally distributed over Great Britain, though absent from Ireland. It has longer hind limbs than the other and is

able to hop. Its eyes are more lateral and the irises reddish-copper colour. The females are usually larger than the males. The natterjack, which is local in England, cannot hop, as the hind limbs are too short, but it is able to run and is often called the running T. Its eyes are more prominent and the irises greenish-yellow; a thin yellow line runs along the middle of the back. During the breeding season the males croak very loudly. The value of Ts. to the farmer and gardener cannot be exaggerated, as they feed entirely on insects, millipedes, woodlice, slugs, and snails. They are quite harmless to man.

**Toadflax**, or *Linaria*, genus of plants and sub-shrubs (family Scrophulariaceae), with a spurred corolla. A number of species grow wild in Britain, but some of them are not indigenous, including the ivy-leaved T. (*L. cymbalaria*), a widely distributed wall and rock plant, which reproduces itself readily from seed and by means of its long rooting stems. The yellow T. (*L. vulgaris*) is a handsome and common hedgerow plant, with terminal racemes and large yellow flowers. Several species are grown in gardens.

**Toadstool**, see FUNGI.

**Tobacco**, plant of the genus *Nicotiana* (family Solanaceae) from which is manufactured smoking and chewing T., cigarettes, cigars, and snuff. There are over fifty varieties of the plant, many of which are cultivated in gardens, but only a few varieties are used for smoking purposes. The varieties of most importance to smokers are *Nicotiana Tabacum* and *Nicotiana Rustica*. The former, a native of the W. Indies, bears pink or rose-coloured flowers and grows from two to nine ft. high. The bulk of T. used in the trade of most countries of the world is produced from this variety. The latter, a native of Mexico, bears greenish yellow flowers, and is a much smaller plant than *Nicotiana Tabacum*. *Nicotiana Rustica* was cultivated by the anc. Mexicans and by the N. Amer. Indians, but early in the seventeenth century it was largely superseded by *Nicotiana Tabacum*.

**Growth and Cultivation.** T. seedlings are grown in sheltered level ground containing loamy, mellow soil, which is burnt to a depth of three in. to kill all weeds, insects, etc., and deposit the essential potash. Sowing takes place in the early spring. The seed is minute, one ounce containing 300,000 to 400,000 seeds, and a tablespoonful being sufficient to sow a bed covering 100 sq. yds. The seed is usually mixed with ash or flour which are white, so that the sower can see where it falls and thus ensure even distribution. After sowing the bed is covered with cheese cloth or grass to protect the plant in the early stages of growth. When the plants are 5 to 6 in. high they are transplanted by hand into fields which have been thoroughly broken up by repeated harrowings. In land that does not drain easily they are usually set in ridges. About 4200 plants are set to the ac. Very careful cultivation is essential. 'Topping', the cutting away of the stalk carrying the top leaves and the flower bud, is necessary

to prevent seeding and to put more strength in the remaining leaves, usually 10 to 16 in number. Harvesting takes place in the hottest part of the year. Leaves may be picked individually as they ripen (known as 'priming'), or by the whole plant method, after which they are conveyed to barns for curing.

**Curing.** Curing is an operation requiring skill and experience. There are four methods: flue-curing; firing; air-curing; and sun-curing. Flue-curing barns are heated by iron flues and the leaves are hung above the flues. No smoke comes into contact with the T. Flue curing is done in three stages: yellowing the leaf; fixing the colour; and drying out the stem; and the whole operation takes four to five days. In fire-curing the T. is hung in the barns over wood fires lit in trenches in the floors and the smoke comes into direct contact with the T. The length of the process varies from a week or ten days to six weeks. Generally speaking, the longer and more gradual the process, the better the result. For air-curing the T. is hung in the barns, protected from the rain, but exposed to the passage of air, and the curing is a natural process extending over about two months. Sun-curing is a similar process, except that in the early stages the leaf is exposed in the open to the sun's rays.

**Production and Types of Tobacco.** The production of T. is world-wide, extending as far N. as Sweden and as far S. as New Zealand. In some countries, China for example, the production is almost entirely for domestic use, and in others, England for example, because of unsuitable climatic conditions, only tobacco of low yield and poor smoking quality can be produced commercially. The prin. types of T. and the main exporting countries are as follows:—(1) *Flue-cured tobaccos*, *Brights* and *Semi-brights*. U.S.A. (N. and S. Carolina, Georgia, Virginia); E. Canada; Nyasaland; Rhodesia; some parts of India; and Brazil. This is the type of T. most used in the United Kingdom, where most cigarettes are made from it, and it is also extensively used in pipe T. It is grown on light, sandy soil and obtains its nourishment from applications of chemical fertilisers. It has a characteristic bright colour. (2) *Burley Tobacco* and *other Air-cured tobaccos*. U.S.A. (Kentucky; Tennessee; Maryland); E. Canada; parts of India; and Nyasaland. This type is used in very large quantities in the U.S.A. both for cigarettes and pipe Ts. It is used to a lesser extent in the United Kingdom for pipe Ts. only. It is grown from distinctive kinds of seeds and its reddish-brown colour is obtained by air-curing. (3) *Dark Fired Tobacco*. U.S.A. (Kentucky, Tennessee, Virginia); E. Canada; Nyasaland; and S. Rhodesia. This type of T. is used for the manuf. of roll and shag T. and produces a strong smoke. It is a large heavy type of leaf grown on richer soil than the flue-cured variety. (4) *Latakia and Latakia type tobacco*. Syria (dist. of Latakia) and Cyprus. Latakia T., has a flavour



peculiar to itself and is used in the United Kingdom entirely in pipe smoking mixtures. It is the smallest of all the tobacco plants and its leaves are barely two in. in length. The whole plant is cured by heavy firing, which gives the characteristic black appearance and distinctive flavour. (5) *Oriental Tobacco*. Turkey; Greece; Bulgaria; and the borders of the Black Sea. Oriental has a highly distinctive aromatic flavour. It is used in Oriental and 'blended' brands of cigarettes. The Oriental T. plant is of small growth, producing a delicate type of leaf. (6) *Cigar Tobacco*, see CIGAR.

*History.* The use of T. dates from remote antiquity amongst the natives of the Amer. Continent. It is mentioned in the observations (1497) of Romano Pane, a friar who accompanied Columbus on his second voyage, as being used medicinally and in religious ceremonies by the tribes of the Antilles. Gonzalo Fernandez de Oviedo in 1526 described the plant and the native custom of inhaling smoke from the burning leaf through a hollow forked cane held to the nostrils. This cane was called tobacco by the natives, and the name was applied by the Spaniards to the primitive cigar and to the plant itself. T. was introduced into Europe in 1559 by Francisco Hernandez de Toledo, a physician who had been sent by Philip II of Spain to investigate the products of Mexico. Jean Nicot, the Fr. ambas. to Portugal, learned of T. in Lisbon and introduced it to the Fr. court in 1560. His association with the plant is commemorated by the botanical name *Nicotiana* and the word nicotine. On its first introduction to Europe T. was valued for its medicinal properties, and it was considered 'a panacea for all the ills that the flesh is heir to.' Sailors returning from the Americas first introduced smoking to England about 1565. Sir Walter Raleigh brought the practice to Court circles. By the end of the seventeenth century, despite attempts to exterminate the practice by means of stringent laws, heavy punishment, and even excommunication from the church, T. was in general use in most parts of the world. The introduction of cigarettes and the two World Wars popularised smoking among women, although women smoked in earlier times, particularly in some E. countries, where it was and still is customary. Smoking by children and the sale of tobacco to them is now forbidden by law in many countries, including Great Britain.

The rate of tobacco duty in the United Kingdom increased from 3s. per lb. in 1900 to 3s. 8d. in 1914, to 9s. 6d. at the beginning of 1939 and to 58s. 2d. per lb. in 1948. From 1900 to 1949 the United Kingdom Gov.'s revenue from the T. duties increased from nearly £11,000,000 a year to £602,000,000 a year, and in 1948 and 1949, except for Income Tax, the T. duties were the Gov.'s largest single source of revenue. A committee appointed by the Treasury in 1923 recommended against gov. financial support of T. growing in England, on the grounds of unsuitable climatic conditions. The

growing of T. in the United Kingdom is subject to Excise regulations and the payment of duty, but in 1948 the gov. announced that although not prepared to repeal the Excise duty on home grown T., they would not for the time being interfere with private individuals growing T. for their own personal consumption.

*Bibliography.* A. E. Tanner, *Tobacco* 1912, 1945; G. L. Apperson, *The Social History of Smoking*, 1914; C. M. MacInnes, *The Early English Tobacco Trade*, 1926; Count Corti, *A History of Smoking*, 1931; and W. W. Garner, *The Production of Tobacco*, 1946.

**Tobago**, is. of the Brit. W. Indies, in lat. 11° 9' N. and long. 60° 12' W., about 75 m. S.E. of Grenada and 22 m. N.E. of Trinidad. The is. is 26 m. long and 7½ m. wide and has an area of 116 sq. m. T. is mountainous in the centre and at the N.E. end, and undulating and flat in the S. and W. The highest peak is 2100 ft. Deep fertile valleys run down from either side of the main ridge. The prin. riv. is the Courland named after the viking duke who in the seventeenth century ruled the is. almost as a sovereign. Scarborough (pop. 1250) formerly called Port Louis, is the cap. The only other tn. is Roxborough (pop. 1000). Sugar was once the staple industry but it was runned by the foreign sugar bounties. Cacao, coco-nuts, and limes have taken its place. The climate is most agreeable; the mean temp. is 80° F., but owing to the long seaboard the heat is generally tempered by a cool sea breeze. In the central and Windward dists. the rainfall varies from 85 to 95 in. and in the N. may exceed 100 in. There is a civil airfield at Crown Point, the S.W. tip of T.; also a gov. wireless station and telephone system. At a distance of 1½ m. from the N.E. end of T. off the vil. of Spoyside (25 m. from Scarborough), is the is. of Little T. The rocks between it and T. are known collectively as Goat Is.

T. is known to many people by its nickname, Robinson Crusoe's Island. For though the actual story of Crusoe's life on his is. of Juan Fernandez was based largely on Alexander Selkirk's adventure there, there can be no doubt that Defoe, in describing his mythical is., had T. in mind.

Columbus discovered T. in 1498 and named it 'Tabago,' from a notion that it resembled in shape the Carib tobacco pipe. Sir Robert Dudley, natural son of the earl of Leicester, is believed to have visited T. and hoisted the Eng. flag in 1580. Nearly thirty-six years later Eng. colonists from Barbados effected the first settlement but no successful settlement was made for nearly a century and a half after the discovery of the is. For the ensuing forty years the is.'s hist. was a ding-dong struggle between Dutch colonists and some Baltic settlers from Courland, varied by Fr. and Eng. invasions. After that and for the next twenty years the is. was declared neutral but, nonetheless, alternated between Fr. and Eng. possession until, in 1814, it was finally ceded to England. By an Act of

1855 T. was given an executive committee or Privy Council, that being its nearest approach to self-gov. In 1898, after a long period as part of Windwards, T. became a ward of the United Colony of Trinidad and Tobago administered by a commissioner. Pop. 27,000. See H. I. Woodcock, *History of Tobago*, 1867; E. C. Digby, *Guide to Trinidad and Tobago* (2nd ed.), 1936-37; Bowman and Bowman, *Cruise's Island in the Caribbean*, 1939; C. Reis, *The Government of Trinidad and Tobago* (3rd ed.), 1947.

**Tobermory**, seaport and burgh of Argyll, on a bay of the same name, 30 m. from Oban. It has a good harbour. Fishing is the chief activity. In 1588, following the scattering of the Sp. Armada, a Sp. galleon sank in T. bay with, it was believed, a great deal of treasure. In 1912 Col. Foss recovered some coins and silver goblets. A further search was made in 1950. Pop. 770.

**Tobit**, Book of, one of the books of the Apocrypha, which, however, is included in the Vulgate. It is a Haggadic romance based on an old tradition, embodying in historical form a series of moral and religious lessons. Its date is given by Ewald as about 350 B.C., but Hitzig places it in the reign of Trajan.

**Tobogganing** (from an Indian word, *tobakkan*, meaning sledge), practice of sliding down natural or artificial slopes of snow or ice. The Canadian toboggan consists of a flat surface curled up backwards and in front. It is about 5 ft. long by 2 ft. broad. T. in its advanced form takes place really only on the Cresta, a valley behind St. Moritz, Switzerland. The sports was started in 1885 by Eng. visitors and took the form of an ann. race between those at St. Moritz and those at Davos, the race being fought out alternately at Davos on a course from Klosters and at St. Moritz on the Cresta. The former is now closed but the Cresta continues. From being a snow run it is now an enclosed track of solid ice three-quarters of a m. long dropping at an average slope of 1:7. There are sev. well-known corners, known as banks, such as the Battledore and Shuttlecock. Down this run, a steel chassis is employed with two steel runners rounded in the front, about 3 ft. long and about 13 m. apart. On this chassis is a sliding seat. The back parts of the runners are grooved. The method of riding is to lie prone with the body on the sliding seat forward, and on coming to a corner the rider pushes his body back upon the seat so that the weight is on the back part of the runners where are the grooves. Steering is effected by pushing the nose of the toboggan round, mechanical forms of steering being allowed. Great skill and judgment are required for fast riding. Racing is done against time, taken by the breaking of two electric contacts, at the start and the finish. A running start from 10 ft. behind the line is allowed; this requires much skill and agility. Finishing speeds are over 80 m.p.h.

Riding the Cresta is recognised as an Olympic event and races were held in the last Olympic Games of 1936 and 1948

under the winter sports category. The two great races are: (1) the Curzon Cup, consisting of six courses from about two-thirds of the length of the course, starting from what is called Junction, and (2) the Grand National, the complete course from the top. These events take place annually, when the track is built: the Curzon Cup is held about Jan. 20, and the Grand National is at the beginning of Feb.

**Bobsleighing** is to be distinguished from T. The bobsleigh is formed of a frame carried on two sleighs fitted with steel runners. Steering is effected by swinging the front runners; this is done by cords or a steering wheel. Under rules at present in force, riders sit facing the direction they are going. At one time the position was prone with heads first but this practice has now been banned. There are many famous places where this sport is popular, notably at St. Moritz in Switzerland and at Lake Placid in America. 'Bobs' vary in size, there being races for those carrying two people and a bigger type carrying five people. The track is usually of beaten-down snow and the banks are usually iced. International races take place and 'bobsing' has been included among the Olympic Winter Sports sections.

**Tobolsk**, tn. of the Omsk Region of the R.S.F.S.R., once cap. of a gov. of the same name. (1) The gov., which had an area of 535,739 sq. m., stretched from Sempalatinsk in the S. to the Arctic Ocean in the N. (2) The tn. is a well-built city on the Irtysh, near its junction with the Tobol, 305 m. E.N.E. of Sverdlovsk (Ekaterinburg). It was once the cap. of W. Siberia and, like Omsk and Yakutsk, a fortified trading post on the Siberian rly. portages, and is a centre for trade between European Russia and Siberia. Shipbuilding, tanning, and the manuf. of soap and tallow are carried on. Here Nicholas II. was imprisoned after the revolution, and it was the scene of considerable strife in 1919. Pop. 25,000.

**Tobruk**, or **Mersa-Tobruk**, port in the prov. of Cyrenaica, Libya. It has an excellent harbour, and was occupied by Italy in 1912. It was the scene of much fighting in the Libyan campaign of the Second World War. See further under AFRICA, NORTH, SECOND WORLD WAR, CAMPAIGNS IN.

**Tocantins**, riv. of Brazil, rising in the state of Goyaz and flowing N. into the Atlantic Ocean through the Rio Para. Its largest trib. is the Araguaya. Its course, which is much interrupted by rapids, is navigable only in some parts. Length 1500 m.

**Toccata** (from It. *toccare* = lit. to touch, figuratively to play). Originally, in the seventeenth century, simply 'a thing to play,' as distinct from *cantata*, 'a thing to sing.' But it soon acquired a sense of touching an instrument, for the purpose of trying or testing it, which meant that it usually contained scales, shakes and other brilliant figuration, often interspersed with slow chordal passages. Modern Ts. usually lay stress on brilliance and rapid execution alone, and are often

more or less uniform in figuration throughout; there is in fact little or nothing to distinguish them from concert studies.

**Toc H**, organisation formed to bring together into Christian fellowship men of every class and opinion for the purpose of social service of all kinds. The name, **Toc H**, comes from the army signallers' designation of the initials, T.H., which stood for Talbot House, opened in Dec. 1915 at Poperinghe in Flanders as a chapel and club for soldiers. It was a memorial to Gilbert Talbot, who was killed in July 1915, and was founded by his brother, Neville Talbot, later Bishop of Pretoria, and the Rev. P. B. ('Tubby') Clayton. In 1920 Clayton formed a small **Toc H** group in London, and in 1922 an auxiliary body, the League of Women Helpers, was organised on the same lines. In the same year **Toc H** was incorporated by Royal Charter. The movement, which unites all Christian denominations, has grown, and there are now many groups and branches throughout the world. **Toc H**, church, All Hallows by the Tower, largely destroyed in the Second World War, was afterwards rebuilt. The war-time hist. of **Toc H** is dealt with in two books by Clayton, *Tales of Talbot House* (1919) and *Plain Tales from Flanders* (1929); its subsequent development and aims are described in current literature issued at headquarters (47 Francis Street, London, S.W.1.). The *Toc H Journal* is pub. monthly.

**Tocqueville, Charles Alexis Henri Maurice Clérét de** (1805-59), Fr. historian, b. at Verneuil, Seine-et-Oise, accompanied Gustave de Beaumont to America to study prisons in 1831, and took the opportunity to collect materials for his *De la Démocratie en Amérique* (1835), a work of peculiar interest as the first reasoned and more or less unbiased exposition of popular gov. in that country. An orthodox Liberal in politics, he was elected vice-president of the Assembly in 1849, as dismissed when Louis Napoleon became emperor, and met with an enthusiastic reception from John Stuart Mill and other great Whigs when he visited England. He pub. *Ancien Régime et la Révolution* (1856). His *Œuvres* were written in 1850-51, first pub. in 1893, and ed. and trans. with an introduction, by J. P. Mayer in 1948. See studies by E. d'Eichthel, 1897; R. P. Marce, 1910; and H. Goring, 1928. See also R. Sottan, *French Political Thought in the Nineteenth Century*, 1931.

**Todas**, The, pastoral tribe 'dwelling in isolated hamlets ('mand') on the slopes of the Nilgiri Hills, S. India.

**Todd, Ruthven** (b. 1914), Brit. poet, essayist and novelist, b. in Edinburgh, and educated at Fettes College and the College of Art, Edinburgh. A leading authority on William Blake. He ed. the Everyman's Library ed. of Gilchrist's *Life of Blake*. A collection of essays entitled *Tracks in the Snow* (1946), deals with the mythology of the eighteenth century in its effects upon Blake, John Martin, and Henry Fuseli, and with the influence of science upon the artists and writers of the period. He has pub. four books of poems,

including *The Planet in My Hand* (1947), and *In Other Worlds* (1950). His first novel, *Over the Mountain* (1939), an allegorical fantasy, was followed by *The Lost Traveller* (1942), and *The Ruins of Time* (1950).

**Todhunter, Isaac** (1820-84), Eng. mathematician, graduate of London and Cambridge. At St. John's College at Cambridge he was a scholar, fellow, and lecturer in turn, heading the degree list as senior wrangler, and gaining the mathematical blue ribbon, Smith's Prize. He was a member of the council of the Royal Society. His text-books on algebra, euclid, trigonometry, and calculus attained a world-wide circulation, and he made original contributions to the calculus of variations and the theory of probability.

**Todi** (anc. **Tuder**), city of Italy, in the prov. of Perugia, 24 m. S. of Perugia. There are remains from the time of the Romans and Etruscans, and a Renaissance church. Pop. 17,000.

**Todi, Jacopone da**, see JACOPONE DA Todi

**Todmorden**, municipal bor. in the W. Riding of Yorkshire, England, 19 m. N.N.E. of Manchester. It has cotton weaving and spinning factories, foundries, and machine shops; and there are coal mines in the area. Pop. 19,100.

**Todt, Fritz** (1891-1942), Ger. engineer, b. at Baden famous as the constructor of the Ger. W. Wall (q.v.), and the *Autobahnen* (motor roads) in Germany. He became Inspector-General of Reich Roads in 1933 and visited Britain in 1937 to study Brit. traffic problems. He was made major-general in 1939 in recognition of his work in the W. anti-aircraft defensive zone, and was appointed Reich Minister of Arms and Munitions in March 1940.

The construction of the Ger. W. Wall had to be carried out at great speed because of the tense political situation, and for this purpose T. created his 'Todt Organisation' by the aid of which the task was completed with almost incredible speed.

**Toga**, prin. outer garment of the anc. Romans, made of woollen material, usually white. It was a large semicircular piece of cloth, the straight side 4 or 5 yds. long, the largest width about 2 yds. It was worn with half the straight side hanging over the left shoulder in front, the other half brought round under the right and over the left shoulder. The 'toga praetexta,' worn by children, magistrates, and priests, had a purple border. At the age of seventeen the youth assumed the 'toga virilis.' The 'toga picta' (embroidered) was worn by generals in their triumph. The emperors wore a purple toga. Mourners and persons unpurged wore a 'toga pulla' of a dark colour, while those seeking office wore a white one, whence the name 'candidatus.' The garment was not allowed to be worn by foreigners or slaves.

**Toggenburg**, upper valley of the R. Thur, canton of St. Gall, Switzerland. It extends for about 30 m. The chief vills. are Lichtensteig, Kirchberg, and Wattwil.

Dairy-farming, fruit-growing, and agriculture are carried on. Pop. 58,300.

**Togoland**, W. African ter. administered under United Nations trusteeship by Britain and France, was a Ger. colony from 1884 to 1914. In Aug. of that year it was surrendered unconditionally to the Eng. and Fr. forces. France administers 21,893 sq. m. (this area including all the coastline) between the Gold Coast Colony on the W., and Fr. Dahomey on the E. The ter. is represented in the National Assembly by three deputies, in the Assembly of the Fr. Union by one delegate, and in the Council of the Republic by two councillors. Britain administers 13,041 sq. m., attached to the Gold Coast Colony and N. Ters. Upper Volta bounds it on the N., the Gulf of Guinea on the S. A chain of highlands runs from S.W. to N.E., the highest point being Mt. Atiakuse (3248 ft.). The chief rvs. are the Volta, which formerly separated T. from the Gold Coast, its trib. the Oti, the Mono, and the Shio, and the Haho which empty into Togo Lagoon. The climate is unhealthy. Palm kernels, maize, rubber, timber, kapok, palm-oil, copra, cocoa, ground-nuts, kola nuts, and raw cotton are exported, and cocoa, tapioca, coffee, coconuts, and oil palms and bananas, etc., are cultivated on fertile tracts which lie between arid plains, whilst dye woods and caoutchouc grow in the forests. The dist. is rich in iron, which is smelted by the natives. Some cattle are reared. The cap. and chief port Lome (29,300 natives and 760 Europeans) is connected by rail with Aneho, the second port, and Palime for Misahöhe, and Atakpame, all in Fr. territory. In Brit. T., of which Yendi is the chief tn., there are no rlys. A trade school has been estab. at Yendi. Straw-plaiting, weaving, wood cutting, smith-work, and the making of earthenware are the chief industrial occupations of the coloured peoples, who, in the S., are of Bantu stock. They speak thirty different languages, of which Ewe is the chief. The inhab. of the N. are of Hamitic descent and speak sixteen languages. The pop. of Fr. T. is 738,000 natives and 1,100 Europeans. The pop. of the Brit. area is 391,400 natives and about 45 Europeans.

Terms of the trusteeship for Brit. T. under the United Nations Charter were approved in 1946 (Cmd. 6863, H.M.S.O.). In 1948 an Anglo-Fr. standing consultative commission was formed, which agreed on co-ordination of medical and educational services, on economic exchanges, and on freedom of movement across the boundaries. See General Maroix, *Le Togo*, 1938; and *Report on the Administration of Togoland for the year 1947*, H.M.S.O., 1948.

**Tojo, Hideki** (1884-1948), Jap. statesman and general, b. in Tokyo, came into office with the expansionist elements in the army and navy and, in 1940, when Prince Konoe founded his new National Party, T., as war minister, was one of the two leading figures in the Cabinet formed by Konoe, whom he succeeded as Prime Minister. In 1941 T. sent

Kurusu, ex-ambas. to Gormany, to Washington with instructions to keep meaningless conversations alive until such time as military and naval preparations in Japan had been sufficiently advanced for Japan's purposes. It was T. who ordered soon afterwards the treacherous attack on Pearl Harbour. During the easily-won victories in 1941-42 before the Allies could deploy their strength, T. assured his position at home in 1942 by dissolving the Diet and appointing a National Service Political Council to control the Diet in the interests of the gov. But in 1944 T. began to realise that the war was closing in on the heart of Japan, and he therefore reorganised the High Command by combining, and himself taking, the posts of war minister and army chief of staff and combining the posts of navy minister and navy chief of staff. He also speeded up shipbuilding and gave priority to aircraft production. But despite these measures the tide of allied victory rolled on, and when Saipan fell, T. resigned and was succeeded by Gen. Koiso. After the Jap. collapse T. was tried in Tokyo (1947-48) and hanged on Dec. 23, 1948.

**Tokay**, or **Tokaj**, tn. of Zemplén co., Hungary, at the confluence of the Bodrog and the Theiss, 148 m. E.N.E. of Budapest. It is famous for the wine to which, it gives its name, *Tokay*. The vine grows on a plateau among the Hegyalja Mts. Pop. 5800.

**Tokelau**, see UNION ISLANDS.

**Token** (**Money**), coin of higher nominal than intrinsic value but exchangeable for full-standard money at the higher rate; or a stamped piece of metal issued as a limited medium of exchange, as for bus fares, and at a nominal value much greater than its commodity value; or anything of only nominal value similarly used, as a piece of paper currency.

**Tokharian Language**, see INDO-EUROPEAN LANGUAGES.

**Tokitaro, Ando**, see HIROSHIGE.

**Tokyo**, or **Tokai** ('Eastern Capital'), cap. of Japan, situated on the S.E. side of the is. of Honshu in the Bay of Tokyo, on the delta of the Sumida R., which separates the city proper on the W. from Honjo on the E. It was founded in the sixteenth century, and until 1868 was known as Jedo, Jeddō, or Yedo ('Estuary Gate'); it received its present name when the court moved thither from Kyōtō. The tn. was opened to foreigners in 1869. The magnificent palace, in Jap. European style, stands in the park Fukiage, not far from the anct. castle. To the E. of the palace lies the commercial and industrial part of the city, while the N. div. is mainly educational, containing the Imperial Univ., the Law School, First Higher Middle School, and numerous beautiful temples. In the W. and S.W. (before the Second World War) were the foreign embassies and legations. The port of entry, Yokohama, is 17 m. distant.

T. has suffered frequently from fire, so many of the houses being built of wood, as well as from storms, earthquakes, and epidemics. The gov. buildings had to be

rebuilt after the fire of 1891. In Sept. 1923 great portions of the city were destroyed by a disastrous earthquake and a fire that followed after. Yokohama suffered even more severely. Nearly 70,000 people were killed in T., and the number that migrated after the disaster brought the decrease in pop. to nearly a million. Reconstruction work was begun at once and by Mar. 1930 was completed. The more important buildings were made both quake and fire proof; three large parks and 51 smaller ones were laid out to serve as refuges; and wherever possible improvements in the planning of the city were carried out. It is lit by electricity, and served by electric tramways.

T. was frequently and heavily bombed by Amer. aircraft, especially by Superfortress aircraft in 1945. Official estimates said that more than 80 per cent of the houses in T. were completely destroyed. The pop. (Feb. 1946) was then still about 3,000,000; in 1940 it was 6,779,000.

See A. Akiyama, *A Complete Guide to Tokyo*, 1937, and N. Nouet, *Tokio: ville ancienne, capitale moderne*, 1937.

**Tokyo Trials**, see JAPANESE (WAR CRIMINALS) TRIALS.

**Tolbooth**, term originally used in Scotland for a booth at a fair in which dues or tolls were collected and offenders against fair regulations were detained—whence it came to mean a prison. The most famous T. was the one in Edinburgh mentioned in *The Heart of Midlothian*. It stood near St. Giles cathedral and was pulled down in 1817.

**Tolbukhin, Fyodor Ivanovich** (b. 1884), see under EASTERN FRONT in SECOND WORLD WAR, *Dnieper 'Rend' battles*.

**Toledo**: 1. Prov. of the Tagus valley, Central Spain, 5925 sq. m. in area, formed (1833) from part of New Castile. It is bounded N. by Avila and Madrid E. by Cuenca, S. by Ciudad Real, W. by Caceres, and is mountainous except in the Tagus valley itself. Various minerals are found but not much worked. Sheep, asses, goats, and fighting bulls are reared, bees and silkworms are also kept. Some textiles, earthenware, wine, spirit (aguardiente), oil, and chocolates are manufactured. Pop. 516,300. 2. Cap. of above, on the Tagus, 50 m. S.S.W. of Madrid, and once cap. of all Spain. It has a fine Gothic cathedral (1227-1493), the seat of an archbishop, and interesting Moorish and Mudjar remains. The great square or 'Zocodover' was once the scene of bull-fights and the burning of heretics. The fine old Alcazar was partially burnt in 1887. Toledan sword-blades were famous in Rom. times, and fine steel cutlery is still manufactured near by, along with textiles and church vestments. Pop. 27,400. See I. Marin, *Recuerdos de Toledo*, 1893; A. F. Calvert, *Toledo*, 1907; H. Lynch, *Toledo* (Med. Town Series); M. Gonzalez Simancas, *Toledo*, 1929. 3. Co. tn. and port of entry of Lucas co., Ohio, U.S.A., on Maumee Bay, at the W. end of Lake Erie, about 92 m. from Cleveland. Manufact. include flour, motor vehicles, glass, bicycles, sugar, and electrical appli-

ances. Its trade is carried on by means of the Great Lakes, canals, and numerous railways. It has a univ. Pop. 278,000.

**Tolerance**, or **Limit Gauging**, permissible range of dimension of a finished article, provided in order to cover unavoidable imperfections of workmanship in the case of pieces intended to fit together, and calculated by fixing the largest and smallest clearances needed upon the working surfaces. As an example, if a metal bar is to be turned down .5 in.; the limits of the finished bar must be .0001 over to .0001 under; therefore the bar may be .5 + .0001 or .5 - .0001. The difference between the two, .0002, is the T. On the drawing the T. would be represented as .5 ± .0001.

**Toleration**, doctrine that a citizen may adopt or discard any religion without state interference. T. became practically universal during the nineteenth century, but the rise of Fascism and Communism tended to restrict it in many countries, though most govts. still claim to support it. T. is not a direct offspring of the Reformation, which accepted the principle 'Cuius regio, eius religio,' a man should follow the religion of his king. In effect, however, this principle implied a theoretical equality of religions and so paved the way for T. Modern indifference to religion also contributed to the development of T. Where it exists, it extends only to matters of doctrine; the State still exercises certain rights as a guardian of morality. See W. K. Jordan, *Development of Religious Toleration*, 1932-38; and T. Lyon, *Theory of Religious Liberty*, 1693-39, 1937.

**Toleration, Act of**, see under ACT.

**Tolima**, dept. of Colombia, lying between the Central and E. Cordilleras. The volcano Tolima rises to 18,425 ft., the highest peak in Colombia. Silver, gold, lead, copper, and sulphur are found, and there is agriculture and stock-raising. Cap. Ibagué. Area 8874 sq. m. Pop. 691,400.

**Tolls**, tax imposed in consideration of some privilege. In the feudal system it meant the right to tollage one's vassals. Later it became the distinguishing mark of a turnpike road, i.e. a road having toll-gates or bars on it, called 'turns.' These 'turns' appear to have been first constructed about the middle of the eighteenth century, when certain interested persons subscribed among themselves for the repair of various roads, and exacted a T. for the privilege of using the roads so repaired. The popular resistance to these exactions led to the passing of Acts to regulate T. These turnpike roads are now extinct. Where a claim to demand T. is made, there is a distinction between a *toll thorough* (through) and a *toll traverse* (across); the former being granted in consideration of the performance of a continuing beneficial service, such as the repair of a road or the maintenance of a bridge or ferry; the latter if permitting the general public to pass over the land of the grantee of the toll. Military vehicles are exempt from payment. Other kinds of T. are *port-tolls*, or charges on goods carried into a port

*turn tolls*, or charges on cattle driven to market and returned unsold, and T. levied by railway companies, as a statutory authority, upon merchandise carried on their lines. For the *Ferries Committee's* proposals (*Ferries in Great Britain*, H.M.S.O., 1948), see under *FERRY*.

**Tolly, Michael Andreas Barclay de, see BARCLAY.**

**Toloccan, see TOLUCA.**

**Tolosa, see TOULOUSE.**

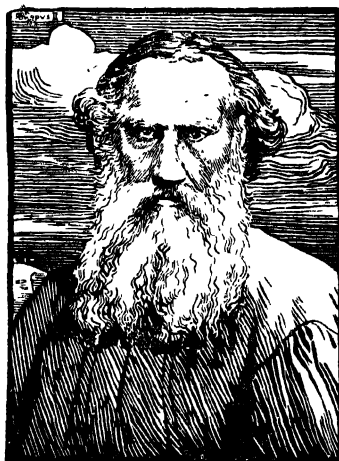
**Tolpuddle Martyrs**, six farm labourers of Tolpuddle, 7 m. from Dorchester, who in 1834 were transported to Australia for forming a trade union which at that time was held to be a conspiracy in restraint of trade. Following a nation-wide agitation they were pardoned two years later. The centenary of the Tolpuddle episode was marked by the pub. of *The Book of the Martyrs of Tolpuddle, 1834-1934*, by the general council of the T.U.C. and of *The Tolpuddle Martyrs* by M. M. Firth and A. W. Hopkinson; and also by a gift to the public of a plot of land including a memorial to the T.M.

**Tolstoy, Alexyev, Count (1817-75).** Russian author, b. at St. Petersburg, son of Count Konstantin Petrovich T. Brought up on an uncle's estate near Tchernigov, which he later inherited, he was educated in Moscow, served in the diplomatic service, and fought in the Crimean War. He wrote ballads and lyrics, set to music by Tchaikovsky. His novels *Prince Sevebrenni* and *The Terrible Tsar* have appeared in Eng. trans. He also wrote a dramatic poem *Don Juan*, but is chiefly famous for his dramatic trilogy, *Death of Ivan the Terrible* (1866); *Tsar Fiodor* (1868); and *Tsar Boris* (1870). See study by A. Lironotelle, 1913.

**Tolstoy, Alexei Nikolaevich (1883-1945).** Russian novelist, dramatist, and patriot, b. at Nikolaievsk, a relative of Leo T. After the Revolution he lived abroad, but the life of an *émigré* did not suit him and he returned to Russia to work on a trilogy, trans. into Eng. as *The Road to Calvary*, which won the Stalin Prize in 1942. As the war developed T. took an ever more active part in sustaining the spirit of his compatriots and became a member of the Supreme Soviet of the U.S.S.R. Until a few days before his death he was at work on the third part of his famous *Peter the Great*, the story of Russia at a previous period of transformation. If he was overshadowed by a greater writer of the same name, he at least made an unchallenged place for himself as a writer of distinction. His play, *Ivan the Terrible*, was produced in 1944.

**Tolstoy, Count, Leo Nikolaevich (1828-1910),** Russian novelist, poet, and social reformer, of noble family, b. at Yasnaya Polyana. Being left an orphan at the age of nine, he was brought up by an aunt, and with his brothers studied under a Fr. tutor until 1843, when he was sent to the univ. of Kazan. He did not distinguish himself scholastically, and on leaving college gave himself up to pleasure for some years. In 1851 he joined the Russian

artillery in the Caucasus, and on the outbreak of the Crimean war took command under Prince Gortchakov and fought at Silistria (1854), and at Sebastopol (1855). During these stirring times he wrote a series of brilliant war sketches entitled *Tales from Sebastopol* which made him famous. He had previously contributed to the Russian *Contemporary*. On his return to St. Petersburg after the war he was welcomed into the gayest social circles and the most exclusive literary cliques, and he won the admiration of



COUNT LEO TOLSTOY

Turgenev, but the respect they had for each other did not grow into anything warmer on account of their differences of opinion. T. freed the serfs on his estate and he was revolutionary in his educational schemes for the peasants, but, always individualistic, he stood outside the progressive Socialistic movement, then growing in Russia. In 1862 he married Sophia Behrs, and he now began his two great masterpieces, *War and Peace*, completed in 1866, and *Anna Karenina*, completed in 1877, and in 1880 he pub. his religious experience in *My Confession*. His later works were written with a conscious didactic and mystical intention, and include *The Cossacks* (1878), *Ivan Ilyitch* (1887), *Childhood* (1888), *Kreutzer Sonata* (1890-1900), *The Kingdom of God is Within You* (1894); and *What is Religion?* (1902). Later in life he gave himself up to studying and supplying the needs of the poor; he renounced his property in favour of his wife and children and endeavoured to introduce a peasant's manner of life into his own household. Estranged from his wife, he found his home embittered and left it secretly, dying ten days later, on Nov. 8, 1910, at Astapovo.

T.'s views cannot be ignored in any

discussion on the nature of art, the philosophies of hist. His diaries give evidence of his struggles of will and spirit at every stage of his long quest for a meaning in life. T. rejected the teaching which followers of various kinds have propounded in his name. His was too solitary and proud a spirit to be lost in that of a teacher, still less of a doctrinaire. Through all his insistence upon the simple moral truths of the Gospels there emanates much of his visionary aloofness. In the last resort, confronting the mystery of death, he stood remote from his own doctrine of salvation, and that is the aspect of T. which Gorky understood so well in his reminiscences of T. Tiring of mere disputation, his constant note is dissatisfaction with his manner of life and renewed resolution to discover in himself greater strength of will, a clearer perception of God's will. Between the obligations of marriage and of his soul's salvation there could be no reconciliation. To be a wife to a seer and a saint was a hard fate for the passionately alive and intelligent Sophie Andreyevna. The fact is, perhaps, that T.'s was an all-consuming egotism, as the most discerning of his Russian critics have always recognised. He would not identify himself with the Russian literature of his own times, but stood aloof. By his repudiation of the State and of the institution of private property, T. proved a great revolutionizing force though he himself disapproved of the revolutionaries. In Russia to-day he is admired as a writer, even though his teaching is held to be injurious. His one outstanding disciple outside Russia was Gandhi. If not a great teacher he exerted great moral influence and remains one of the world's supreme artists.

His *Works* were translated into Eng. by N. H. Dole (19 vols 1889-90); the Oxford Centenary Ed., being the authorised trans. by Aylmer Maude, was begun in 1928 and ten of the 21 vols. have been issued (1932). The Moscow Ed. of all T.'s writings in the original 100 vols. is in preparation. See lives by Bruckoff 1905, 1906; Aylmer Maude, 1908, 1931; R. Rolland (Eng. trans.), 1911; E. Garret, 1914; S. Zweig, 1929, 1949; E. J. Dillon, 1934; G. Abraham, 1935; D. Leon, 1946; and E. J. Simmons, 1948. See also M. Gorky, *Reminiscences of Tolstoy*, 1920; *Tolstoy's Love Letters*, trans. by S. S. Kotliarsky and Virginia Woolf, 1923; J. Lavrin, *Tolstoy; a Psycho-Critical Study*, 1924; A. Maude, *Tolstoy on Art*, 1925, and *Family Views of Tolstoy*, 1925; Leo Tolstoy, Jnr., *The Truth about my Father*, 1927; *The Private Diary of Leo Tolstoy* (1853-57), trans. by L. and A. Maude, 1927; Countess A. Tolstoy, *The Tragedy of Tolstoy*, 1933; T. Palmer, *Tolstoy and his Wife* (Eng. trans. 1946).

**Toltecs**, semi-legendary people of Mexico and Central America, to whom the Aztecs and Mayas ascribed many cities, monuments, and arts. Though their certain origin is not known, they were the reputed conquerors of the Mayas. They are said to have migrated southward along the Mexican plateau from the N. In the

basin of Mexico they subdued the tribes already settled on the land and founded their own cap., calling the land Anáhuac, 'edge of the water,' on account of its many lakos. They reached the zenith of their power between A.D. 700-1100, conquering many neighbouring tribes, and in time the confines of their empire extended as far N. as the Tropic of Cancer and as far S. as the S. border of Guatemala. The legendary Toltec leader, Quetzalcoatl ('Feathered Serpent'), who is said to have died in A.D. 895, forced the Maya city states to cease their internecine warfare and accept his rule, but when the power of the T. declined the Mazas resumed their mutual strife, which resulted in their abandonment of the tns of N.W. Yucatan. The legendary hist. of Quetzalcoatl is found in *Historia de Colhuacan y de Mexico* (see Selser's *Commentary* (Eng. trans. by A. H. Keane), 1901-02). See also P. James, *Latin America*, 1942.

**Tolu**, see under BALSAM.

**Toluca**, or **Tolocoacan**, tn. of Mexico, cap. of the state of Mexico, 45 m. S.W. of the city of Mexico. It is a summer resort and the centre of an agric. and stock-farming region. The Nevado de Toluca, an extinct volcano (14,950 ft.), lies S.W. of the tn. To reach T. from Mexico City, a distance of only 40 m. by road, it is necessary to climb above 10,000 ft. over the intervening mt. range. The centre of the region known as the basin of T. is swampy; maize, wheat, beans, and alfalfa are grown. Included in this dist. of concentrated settlement is the old mining community of El Oro. There are flour and textile mills and a power plant. Pop. 43,500.

**Toluene**, **Methyl Benzene**, or **Phenylmethane** ( $C_6H_5CH_3$ ), a mobile liquid (boiling-point  $110^\circ C.$ ) which resembles benzene in most respects. It is prepared from the 90 per cent. benzol obtained from coal-tar, and is used in the preparation of aniline dyes, explosives, and many other compounds.

**Toluidine**. The Ts. or amido-toluenes ( $C_6H_4(CH_3)NH_2$ ) are prepared from the corresponding ortho-, meta- and para-nitrotoluenes by reduction. Ortho- and meta-T are oils boiling at  $197^\circ$  and  $199^\circ C.$  respectively. Para-toluidine is crystalline, melts at  $45^\circ$  and boils at  $198^\circ C.$  The Ts. resemble aniline in their reactions and the ortho- and para-compounds are employed in the manuf. of aniline dyes.

**Tomahawk**, war-hatchet of the N. Amer. Indians. Originally it was composed of a stone head tied to a wooden handle by leather thongs. One end of the stone was sharpened and the other hollowed into a pipe bowl, to which the hollow handle acted as stem. Subsequently steel and iron heads were introduced by Europeans.

**Tomaso de Vio**, see CAJETAN, JACOPO.

**Tomato**, or *Lycopersicon esculentum*, annual plant (family Solanaceae), bearing globose red or yellow fruit, formerly known as 'love apples,' was introduced into England in 1596, but only since 1900 has it come into immense popularity in Britain, its production chiefly under

glass, now being a large and important industry. Its production is world-wide. Except in sheltered and especially favoured situations, and when the season is sunny, the culture of the fruit out of doors is unsatisfactory. The plants are raised from seed early in the year in warmth. They are confined to a single stem, shoots at the axils of the leaves being regularly pinched out. Liberal watering and manuring are necessary while the fruit is setting. Late fruit may be ripened in the dark in a temp. of 50° F.

**Tomb** (Gk. *τύμβος*), properly signifies a mass of masonry or stonework raised over a grave or vault used for interment; but it is applied, in a wider sense, to any sepulchral structure. Of primitive sepulchre there are two classes, one subterranean, the other of raised mounds or tumuli. Monuments of the first kind are numerous in Egypt; the Pyramids had no doubt a common origin with the tumulus. At some places in Etruria the Ts. are hewn out on the sides of rocks and hills, and their entrances present an architectural facade. Sepulchral edifices are numerous throughout Latium and Magna Græcia; many are remarkable for the architectural decoration bestowed on them. The Ts. of the Middle Ages are within buildings (churches, chantries, cloisters, etc.), and exhibit a variety of form and enrichment, from the primitive stone coffin to the lavishly decorated canopied monuments. Another class consists of *Altar* or *Table Tombs*. The next in order is the *Effigy Tomb*, first introduced in the thirteenth century, with a recumbent figure of the deceased upon it, extended, with the hands slightly raised and joined in the attitude of prayer. Altar and effigy Ts. were usually placed between the piers of an arch, or within a recess in a wall, and the whole T. was frequently covered by an arch forming a sort of canopy over it; of which kind is that of Aymer de Valence in Westminster Abbey. See also BURIAL CUSTOMS.

**Tombigee**, riv. of U.S.A. rises in Prentissco, Mississippi, and flows S. to unite with the Alabama R. to form the Mobile R. Length 500 m.

**Tombouctou**, see TIMBUCTOO.

**Tomi** (later **Tomiswar**, or **Jegni Pangola**: modern **Kustendje**, or **Constanta**), tn. of Thrace (later *Moesia*) on W. shore of the Euxine. It was once cap. of Scythia Minor, and is famous as the place to which Ovid was banished. T. was colonised from Miletus (c. 600 B.C.).

**Tomlinson, Henry Major** (b. 1873), Eng. writer, b. in London. He served in London shipping for many years. Some stories and sketches which he contributed to the *Morning Leader* later led to an appointment on the editorial staff of that newspaper. T.'s first experience at sea was in 1904 with the trawlers over the Dogger Bank. Since then he has sailed in Brit. warships, and in liners and cargo ships under many flags, to all parts of the world. He was in France during the First World War as an official correspondent, after which he was for six years (1917-23) literary editor of *The Nation*

and *Athenæum* under H. W. Massingham's editorship. His first book, *The Sea and the Jungle*, was pub. in 1912, followed by *Old Junk* in 1918; his first novel, *Gallion's Reach*, which won the *Femina-Vie Heureuse Prize*, appeared in 1927. More recently he has pub., *The Wind is Rising* (1941), *The Turn of the Tide* (1945), and *Morning Light* (1946).

**Tommasini, Vincenzo** (b. 1880). It. composer, b. in Rome. He studied violin and composition in Rome and later, under Max Bruch, in Germany. Among his operas are *Medea* (1906), *Uguale fortuna* (1913) and *Le Donne di buon umore* (*The Good-Humoured Ladies*), a one-act comedy on motifs of Domenico Scarlatti written for Diaghilev's Russian Ballet (1919). He has also composed various orchestral works, among which are *Chiari di luna*, successfully performed at the Augusteo and elsewhere, and instrumental and chamber music.

**Tommaso di Stefano**, see GIOTTINO.

**Tommy Atkins**, slang name for the Brit. private soldier; more shortly 'Tommy' as in the opening poem of Kipling's *Barrack Room Ballads* (1892). 'Tommy Gun,' see under SUBMACHINE GUN.

**Tomsk**: 1. Region of the R.S.F.S.R. 2. Former cap. of above. A branch line connects it with the great Siberian railway at Taiga, and there is steamer communication with Barnaul and Bysk and up to the Urals. It declined as a centre in the old trade route from the E. when the railroad was constructed to the S., taking traffic through Omsk and Krasnoyarsk instead of through T. and Yeneseisk. Plans have been made to build another railroad from T. to Tobolsk. There are flour-mills and aero engine works, metallurgical, and leather tanning factories in the tn. Pop. 141,200. Cultural centre of Siberia, the univ. dates from 1888. See SIBERIA.

**Tom Thumb**, see under DWARF.

**Tonit**, see TIT.

**Ton**, or **Tun**. Ton is now always used for the measure of *weight*. 1 T. = 20 hundredweight, therefore in Eng. 2240 lb.; but in the U.S.A. also (especially for goods sent by sea) 2000 lb. Hence the terms 'long' and 'short' T. (See TONNAGE). The spelling tun is now restricted to the old measure of *capacity* from which the weight is probably derived, since a tun of water weighs approximately a ton. The metric ton is 2,204.6 lb.

**Tonalite**, type of quartz diorite found in the Adamello Alps. Plagioclase quartz, hornblende, and biotite are dominant minerals, with magnetite, zircon, etc., as accessories. The granite-diorites of the U.S.A. are of this type, which is also found among the Scottish plutonic rocks.

**Tonality**, synonym for key, in music, but also meaning, more specifically, the feeling of a definite key suggested by a composition or passage. In modern musical terminology two antithetical derivatives of the word have appeared, *atonality* (q.v.), and *polytonality* (q.v.).

**Tonbridge**, or **Tunbridge**, tn. of Kent, England, on the Medway, 27 m. S.E. of



London. Printing, cricket-ball making, tanning, tar-distilling, and the manuf. of plastic goods are the chief industries. Remains of T. Castle, founded soon after the Norman Conquest, are in existence. Tonbridge School was founded in 1553 by Sir Andrew Judd, but little of the sixteenth-century building remains. New additions were completed in 1894. (See hist. by D. C. Somervell, 1947). Pop. 20,000.

**Tone**, term used in Eng. for pure musical notes not charged with harmonics, each harmonic being itself a T.; also for the quality of a musical sound, especially with reference to performance. The word T. does not imply pitch; but in America it is often used confusingly as synonymous with 'note,' doubtless under the influence of the Ger. *Ton*. See also RESULTANT TONES.

**Tones, Partial**, see HARMONICS.

**Tone, Theobald Wolfe** (1763-98), Irish patriot, b. in Dublin and educated at Trinity College there. He was called to the Irish Bar in 1789, but devoted himself to politics, and printed articles attacking the gov. and agitating against it. In 1790 he founded the society of United Irishmen, hoping to unite Catholic and Protestant in the cause of Irish independence. He went to the U.S.A. in 1795, and in the following year to Paris, where he tried to promote an invasion of Ireland. He was given a command under Hoche, whose expedition did not effect a landing. He was captured in 1798 on a vessel in Hardy's squadron, and was tried by court-martial, and sentenced to death for treason, escaping execution by suicide. His *Autobiography* was pub. in 1893. See lives by A. de Blacm, 1935, and G. F. MacDermot, 1939.

**Tonga bean**, see under COUMAROUNA ODORATA.

**Tonga Islands**, or **Friendly Islands**, kingdom under Brit. protection situated in the W. Pacific to the E.S.E. of Fiji between 18° and 22° S. lat., with an area of 269 sq. in. The group consists of about 150, mostly small is., thirty-six of which are inhabited. They were discovered by Tasman in 1643, and visited in 1777 by Cook, who, on account of the disposition of the natives, called them the Friendly Is. Most of the is. are of coral formation, though some (Tofua, Kao, and Niunfoou or Good Hope Is.) are volcanic. There are two volcanoes, and the is. are subject to frequent hurricanes. The Tongans are Polynesians, closely allied to the Maoris and Samoans. Tonga is a self-governing protectorate under the protection of Great Britain, estab. by a treaty of friendship and protection signed in 1900. The is. are ruled by Queen Salote, who succeeded her father, King George Tupou II. in 1918. The kingdom mainly consists of three is., Tongatabu, Ha'apai and Vava'u. The inhab. are mostly converted to Christianity, the first Wesleyan missionaries having landed in Tonga in 1826. The Wesleyan Free Church of Tonga and its offshoots have 34,000 adherents; Rom. Catholic, 6000; Latter Day Saints, 2000.

There are both gov. and mission primary schools, primary education being compulsory between the ages of 6 and 14. There are secondary schools, with 1340 boys and girls. There are three public hospitals, the main one being at Nuku'alofa (the cap.). The soil is very fertile, and the chief exports are copra and bananas; other exports are kava, green fruit, and candle-nuts. All copra is now shipped to the United Kingdom and bananas to New Zealand. The imports include drapery, flour, sugar, fish



E. N. A

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timber, and hardware. Exports were valued at £748,109 in 1917 and imports at £391,240. There is no public debt and the amount of accumulated balances (June 30, 1916) was £216,000. The main source of revenue is customs duties. There is a monthly steamship service from New Zealand via Fiji, and vessels call at frequent intervals to load copra for the United Kingdom. There is an excellent aerodrome on Tongatabu, and seaplane facilities at Nuku'alofa harbour. There are five wireless stations in the group and a telephone service in Nuku'alofa. The constitution provides for a gov. consisting of the Sovereign, a privy council and cabinet, a legislative assembly and the judiciary. The Sovereign presides over the privy council which consists of the premier, the ministers (at present three Tongans and one European, who are also heads of gov. depts.) and the governors of Vava'u and Ha'apai. The constitution of the cabinet is similar, except that the premier presides. The legislative assembly consists of the premier, and ministers of the Crown (including the two governors), seven representatives of the nobles elected by the nobles themselves and seven rep-

representatives of the people elected by popular franchise. The courts consist of a supreme court, a magistrate's court and a land court. Pop. (1947) 43,300 Tongans, 212 Europeans, and 950 others.

**History.**—The first Europeans to visit any part of the T.I. were the Dutchmen Cornelis Schouten and Jacob le Maire in 1616. After Tasman, the next arrival was the first Englishman to land in Tonga, Capt. Wallis, who, in 1767, gave the name of Keppel to the N. is. of Niutobutabu and exchanged some iron nails with the natives for food. A few years later these nails were shown by the natives to Cook, who paid sev. visits to the group between 1773–77 and gave a full account of the is. and people on his return home. After Cook's time the T. I. began to be torn by civil wars between sev. contemporary dynasties, from which it was rescued, after long and heavy fighting, by a member of the 19th Tu Kanokubulu (or third dynasty), Taufa'ahau Tubou, an able warrior and administrator who had been converted to Christianity in 1831, when he and his wife, at their baptism, took the names of George and Salote (Polynesian for Charlotte) in honour of George III. and his consort, and these names have persisted in the Tubou dynasty to this day. By 1845 King George I. Tubou had brought the whole of Tonga under his rule and when he *d.* in 1893, at the age of 96, he had united the kingdom, given the people a land system, a constitution, and the beginnings of parl. gov. in a modern Christian state. The results of Brit. protection, however, has been to sustain and strengthen the Tongan's independence and national characteristics. The Tongans have their own currency notes and postage stamps, and the language of the gov. or the departments is Tongan. Foreign affairs are transacted through the Brit. agent and consul, who represents in Tonga the high commissioner for the W. Pacific. His consent is necessary for the appointment of Europeans to the Tongan gov. service. In other respects the country is completely autonomous. See Sir H. Luke, *Britain and the South Seas*, 1945.

**Tongaland, see AMATONGALAND.**

**Tongariro**, volcanic mts. in the N. part of the N. Is. of New Zealand, Wellington prov., 20 m. S.S.W. of Lake Taupo. The N. plateau, to which the name is confined, has eight craters. To the S. is Ngauruhoe (7515 ft.), which was in eruption in March 1909. The Red Crater and Te Mari are also still active.

**Tongeren** (Fr. Tongres), city of Limbourg, Belgium, 12 m. S.E. of Hasselt, generally considered to be the oldest tn. of Belgium. It is the anct. Atuaticum, cap. of the Eburones, which became Civitas Tongrorum under the Romans. Part of the defensive wall, built in this last period, has been laid bare recently. T. has an important cattle mkt. Pop. 13,500.

**Tong-king, Tonkin, or Tonquin:** (1) prov. of the republic of Viet-Nam within the Fr. Federation of Indo-China. It is bounded N. by the Chinese provs. Kwang-

tung, Kwangsi, and Yunnan; W. by Laos; S. by Annam; E. by the gulf of Tong-king. The Song Koi or Red R. flows from N.W. to S.E. The mountainous, plateau, and forest land lies chiefly N. and W.; there is flat, low-lying, fertile land to the S.E. Area 40,530 sq. m. There are a number of small is. off the coast. Gold, silver (at Ngan-son), antimony, tin, and coal (at Hongai) are found, and there are rich limestone quarries and calamine mines. Teak, ebony, and sandalwood are the most valuable woods produced. Round the deltas of the Red R. and the Thajbinh rice is extensively grown, and forms the chief crop. In other parts are plantations of coffee, tobacco, maize, arrowroot, tea, ramie, cotton, jute, sugar-cane, and mulberry and some other fruits. Vegetables, betel-palms, arca-nuts, bamboos, hemp, indigo, gamboge, pepper, and cinnamon are also produced. A large quantity of rare silk is produced; some of it is exported, and the greater part is woven by the natives. The litchi (lichee or leechie) tree is a native of T. The chief imports are tools and machinery, beverages, yarn, and tissues and the prin. exports are iron, coal, castor and lac oils, essences for perfumery, rice, maize, and animal products. Haiphong is the chief port and Hanoi the cap. Hanoi replaced Saigon as cap. of Fr. Indo-China (1902), and is connected by rail with Haiphong and with Vinh. It has various mills, foundries, distilleries, and breweries, and a school of medicine for natives (opened 1902). In 1917 the univ. of Indo-China was opened with ten faculties. T. formed part of the kingdom of Annam until the Fr. residency was created in 1884, and it became part of Fr. Indo-China. In 1941 a Federal Council was estab. as a measure of political reform, and to this T. sent six members. At this time T. and other parts of Indo-China had come to have strategic importance to the Jap., and this was recognised by the agreement signed on July 23, 1941, between Japan and the Vichy Gov. of France. Jap. penetration increased until in March 1945 the Jap. took over the control of industrial plants in Hanoi and elsewhere. An Annamese declaration of independence was sponsored by Japan, and on June 30 a separate state of Viet-Nam, comprising T. and Annam, was proclaimed under Jap. auspices. With the defeat of Japan Fr. forces were engaged in re-establishing Fr. authority in Indo-China. On March 6, 1946, the Viet-Nam Republic was formally recognised, but this did not prevent the continuation of sporadic fighting between the Fr. and the guerilla forces of the extreme nationalists in T. and Annam. Pop. (1942) 9,920,000. See J. Dupuis, *Le Tong-kin*, 1898; De Lajonquière, *Ethnographie du Tong-king Septentrional*, 1906; A. Guisman, *L'Œuvre de la France au Tonkin*, 1906; C. Madrolle, *Indo-Chine du Nord: Tonkin*, etc., 1925; A. H. Brodrick, *Little China; The Annamese Lands of Indo-China*, 1942. See INDO-CHINA, FRANCE, and VIET-NAM. (2) Gulf of, an arm of the China Sea, of average

breadth 150 m., receiving the Songkoi. It is bordered by T., Kwangtung, and Hainan Is.

**Tongue**, movable muscular organ attached to the floor of the mouth, and concerned in the operations of mastication, deglutition, speaking, and tasting. The T. consists of a mass of muscle symmetrically arranged about a middle line from tip to roof. The base is attached to the hyoid bone; the upper surface, or dorsum, is free; the edges and the anterior portion of the lower surface are free. A fold of the investing mucous membrane is situated in the middle line of the under surface; this is the *frænum linguae*, or 'bridle' of the T. The substance of the T. is striped muscle. It is supplied by branches of the lingual artery, whose origin is the external carotid. The nerves of the T. are the gustatory, for touch and taste sensations, the glossopharyngeal, supplying the posterior third, and the hypoglossal, which conveys motor stimuli. The surface of the T. is covered with squamous epithelium and is supplied with numerous papillæ (see TASTE). The T. is liable to many morbid changes. By easily-recognised phenomena of furring, etc., the existence of disease of the alimentary canal is indicated. Acute inflammation is caused by wounds, and may lead to the formation of abscesses. Chronic inflammation is due to prolonged irritation, as by a broken tooth or excessive smoking. It may be followed by excessive growth of the surface cells leading to the formation of a cancer. Cancer of the T. is painful and dangerous, the only hopeful treatment being early removal by surgical operation.

**Tongres**, see TONGEREN.

**Tonic**, in medicine, an agent which tends to re-establish the proper performance of the functions of the body in general, or of some particular organ.

**Tonic**, in music, the fundamental key-note of a scale. See MUSIC.

**Tonic Sol-fa**, see under SOLMISATION.

**Tonic Sol-fa College**, see under CURWEN, JOHN.

**Tonk**, chief tn. of the State of Tonk, Rajasthan, India, near the Banas R., 60 m. S. of Jaipur. Pop. 39,700. The State has an area of 2553 sq. m., including sev. detached regions. Pop. 353,700.

**Tonlé-Sap**, see TAILÉ-SAP.

**Tonnage** of a ship is the measure of its cubical or carrying capacity expressed in tons. There are now in use four methods of expressing the T. of a ship, known respectively as the gross T., the net register T., the dead-weight T., and displacement T. Before 1836 (1812 for warships) there was in use a much rougher and more inadequate measure, the 'builders old measurement' (B.O.M.), which, however, is still sometimes referred to. In calculating the gross T., the whole interior capacity of the ship below the T. deck is found, together with that of all covered-in spaces on deck used for stowage, and the result in cubic feet is divided by 100. Tonnage Deck is the upper deck in all ships which have fewer than three complete decks; and is the

second deck from below in all other ships. A 'register' ton is a measurement of space calculated from the average bulk of light freight. The net register T. is the gross T. minus all those spaces used for the working parts of the ship or for the accommodation of crew or instruments. It is on this T. that dues are almost invariably paid. The dead-weight T. is the measure of the exact amount of cargo, bunkers, stores, etc., that a ship can carry when floating at her load draught. The displacement T. is that in use since 1872 for all ships of war throughout Europe. The amount of water displaced by a ship is, of course, equal in weight to the ship and all that it contains. Since 35 cub. ft. of water weigh one ton, the displacement T. is found by dividing by 35 the number of cubic feet of water displaced when the ship is immersed to its draught- or load-line.

**Tonnage and Poundage**. Tonnage, a tax from 1s. 6d. to 3s. levied on each tun of wine or liquor imported into or exported from the United Kingdom, and poundage, a similar tax of 6d. to 1s. on every pound of dry goods, were first levied in 1371. James I. asserted his right to alter the rates of levy as he chose by means of additions called *impositions*, and secured a decision in his favour on the legality of such additions against the merchant Bate. Parliament never ceased to protest against this denial of its claim to control taxation, and the resistance of Hampden to the collection of the tax expressed the widespread discontent over the question which contributed much to the outbreak of the Civil war. In 1660 it was granted to Charles II., made perpetual under Anne, and abolished, on the reorganisation of customs and excise in 1787.

**Tonnage Dues**. Rates levied on the tonnage of ships entering ports or navigable public waters. Such rates are imposed by local Acts; and the mode of computing tonnage for the purposes of the dues may be that set out in the particular local Act, or may, with the consent of the Ministry of Transport, be on the registered tonnage as ascertained according to the rules made under the Merchant Shipping Act, 1894. The dues are devoted to the upkeep of harbours, wharves, etc., and the maintenance of buoys, lighthouses and light vessels. Pilotage dues are often paid on tonnage and all ships passing through the Suez, Panama and other canals pay tonnage dues. By the constitution of the U.S.A. no State may impose T.D. without the consent of Congress; but a municipal corporation may levy a wharfage rate on the owners of unused steamboats mooring at a wharf.

**Tonquin**, see TONG-KING.

**Tonsils**, pair of almond-shaped bodies situated in the fossa behind the pillars of the fauces in the pharyngeal cavity. Each consists of a mass of lymphoid tissue plentifully supplied with blood vessels, and is covered with mucous membrane which dips into depressions called crypts. The T. secrete a viscous fluid which acts as a lubricant to the respiratory passages and they also function as lymph glands.

Inflammation of the tonsils, *tonsillitis*, is caused by the introduction of septic organisms through the mouth, or by way of the blood. It usually commences with slight rigors, and the characteristic swelling soon makes its appearance. The swelling is accompanied by pain, and swallowing and even breathing may be rendered difficult. The temp. rises and usually a certain amount of suppuration takes place. A yellowish secretion appears on the surface of the T., which may be brushed away or removed by gargling. Hot poultices should be applied to the neck, and if suppuration has taken place the T. should be stabbed to release the pus, though this operation requires care, on account of the proximity of the T. to large blood vessels. The inhaling of steam mixed with antiseptic vapours is useful in relieving the condition. In chronic *tonsillitis* there often occurs a permanent overgrowth of the substance of the T., usually associated with adenoids, and causing difficulty in breathing, which is best dealt with surgically.

**Tonsure**, the cutting of the hair in a certain form as a symbol of self-dedication to the monastic life. The custom first appears at the end of the fourth or beginning of the fifth century. In the ant. Celtic Church all the front of the head was shaved in front of a line drawn from ear to ear. In the Oriental churches the whole head is shaved. In the Rom. Church the 'coronal of St. Peter' has always been used. In this T. the crown of the head is shaved to leave a fringe of hair all round.

**Tontine**, form of mutual life insurance in which a number of people invest a sum of money in the purchase of a property. They share the income, and as each dies the shares become proportionately larger per survivor, until all the property eventually devolves on one. It owes its name to an It. banker, Lorenzo Tonti, whose idea it was. In France and in Great Britain, in the eighteenth century, the State raised money by this means.

**Tools, Machine.** The most important machine for producing finished work with Ts. is the *lathe* (q.v.). Since the invention of the slide-rest during the last century it has been possible to turn out very accurate work, since this affords a rigid support for the T. being used and can traverse it parallel to the piece that is being worked. The *planing machine*, invented by Clement about 1825, is used for producing a truly level surface. In these machines the work moves under stationary Ts. on a rolling bed. The weight of certain objects which require planing, such as armour for battleships, demands that the energy for reversing the mass be much greater than that required for the actual cut, hence for such work the machines often have a fixed bed and movable Ts. But to-day planing is being gradually superseded by *milling*, where a rod or disc has a serrated and sharp edge, shaped to the cut required. This milling-cutter is kept revolving at a high speed and quickly removes the surface presented to it; whereas a planer

can only remove at the outside limit a piece of material  $\frac{1}{8}$  in. wide for each tool which seldom exceed four in number. Other Ts. which help to make the complicated mechanical productions of modern life are the drilling machine, the slotting machine, the shaping machine, and the boring machine. *Drilling machines* on certain occasions are of the multiple variety, i.e. sev. spindles are worked at once, if it is necessary to drill a great many holes in a plate, such as a boiler firebox or the like. Adaptors are also made nowadays for fitting taps into small drilling machines so that it is possible to tap small holes by this machine, instead of having to use hand labour. *Shaping machines* are really planers on a small scale with moving Ts.; the mechanism employed is of the steam engine type, i.e. the T. is moved by means of a crank and connecting rod; it is used on light work for facing up cottars and the like. *Boring mills* may be either horizontal or vertical; they are largely used for cylinders and guns, and the like. Cylinders 12 ft. in diameter may be bored on these machines, while holes 15 or 16 in. in diameter can be bored for some 60 ft. in length, e.g. on such work as guns and propeller shafts. In addition to these machines, the wood-worker is now provided with a universal wood-working machine that will cut holes of any shape, etc.; so much so that a high percentage of furniture is machine-made to-day.

See E. Pull and F. J. Taylor, *Workshop Practice*, 1935; W. H. Atherton, *Workshop Practice*, 1942; P. Gates, *Jigs, Tools, and Fixtures*, 1944.

**Toothwort** (*Lathræa*), genus of plants (family Orobanchaceæ), partly parasitic and partly saprophytic. *L. squamaria*, the only Brit. species, has a fleshy branched rhizome clothed with tooth-like scales and bearing a raceme of drooping dull red flowers.

**Tooting**, dist. of the bor. of Wandsworth, S.W. London, until 1945 a parl. div. It is largely residential, and there are industries. Pop. 38,200.

**Toowoomba**, tn. of Queensland, Australia, 101 m. W. of Brisbane, is situated in a pastoral and agric. dist. It has condensed milk, bacon, and butter factories, foundries, and railway workshops. Pop. 34,000.

**Toparé**, see POLONNARUWA.

**Topaz**, mineral crystallising in the orthorhombic system, with cleavage parallel to basal face. A fluosilicate of aluminium ( $Al_2(F,OH)_2SiO_6$ ). The colour range includes colourless, yellow (pale to brown), blue, pale green. Hardness, 8, sp. gr. 3.5. The pink T. seen in jewellery is produced by heating brownish-yellow stones which change colour on cooling. On heating or rubbing, T. becomes electrified (pyro-electric). Abundantly found in Brazil, Siberia, and Ceylon. In the Brit. Isles T. has been found in the Cairngorm Mts. in Scotland, Mourne Mts. in Ireland, and in Cornwall. The true T. should not be confused with the yellow quartz known as citrine (Hardness, 7., sp. gr. 2.65). There is also the yellow

sapphire, sometimes sold as Oriental T.

**Tope** (Hind. *tōp*, prob. from Pall *thūpo*, Sanskrit *sthūpa*, a mound), common name for a kind of Buddhist monument erected by monks to enshrine relics of Buddha or his disciples. Most Ts. take the form of a tumulus of masonry, shaped like a dome or tower, and often surrounded by an elaborately-carved stone railing with lofty gates far higher than the railings. When the purpose of the Ts. is for the preservation of relics, it is called a *dagoba*, and when its purpose is merely to commemorate some event, the usual name is *stupa*, the word T. only connoting the external shape.

**Topeka**, cap. of Kansas, U.S.A., and co. seat of Shawnee co., on the Kansas R., 58 m. W. of Kansas City. It is a large manufacturing centre, and has railway work-hops, and in the vicinity are quarries and coal mines. Pop. 67,800.

**Tophane**, see CONSTANTINOPLÉ.

**Tophet** ('the place of burning'), high place in the valley of Hinnom, where sacrifices were offered to Moloch.

**Topiary**, training and clipping of trees and shrubs into ornamental shapes. The art was most greatly developed in Tudor times, and was a definite feature of old-world gardens: some of the more ambitious examples still exist at Elvaston Castle, Derby, and Leven's Hall, Westmorland. Evergreens are most popular for T. work, though hawthorn stands up to clipping well and is often used. The two best species, being long-lived and able to withstand severe and constant clipping, are yew (*Taxus baccata*) and box (*Buxus sempervirens*). Holly (*Ilex aquifolium* and its variegated varieties) and evergreen oak (*Quercus ilex*) are often used, and the larger-leaved sweet bay (*Laurus nobilis*) and Portugal laurel (*Prunus lusitanica*) may be trained in simple, formal shapes.

**Toplitz**, see TEPLITZ.

**Toplady, Augustus Montague** (1777-78), Anglican divine and hymn-writer, b. at Farnham, Surrey, and educated at Westminster and Trinity College, Dublin. He entered the Church in 1762, and became vicar of Harford (1766) and Broad Hembury (1768). In 1775 he became minister at the Pr. Calvinist Chapel in London. He is remembered for his hymn, 'Rock of Ages.' See life by T. Wright, 1911.

**Topographic Surveying**, see under SURVEYING and LEVELLING.

**Topography**, see MAPS; MAP READING.

**Topolias**, see COPAIS.

**Topolino Stato**, see TRIESTE.

**Topsail**, see SAILS and RIGGING.

**Torbanite**, see BOGHEAD COAL.

**Tor Bay**, on the S. of Devonshire, England, was the landing place of William of Orange (1688). On its shores are the tns. of Torquay, Paignton, and Brixham.

**Torch-thistle**, see CERUFA.

**Tordesillas y Herrera, Antonio de**, see HERRERA.

**Tore**, see under PYGMIES.

**Torgau**, tn. of Saxony-Anhalt, Germany, on the Elbe, 30 m. N.E. of Leipzig. The battle of T. was fought in the vicinity,

Nov. 3, 1760, when Frederick the Great defeated the Austrians under Daun. Its fortifications were levelled in 1889. Glass, pottery, and gloves are made. It was the scene of the first allied link-up in the Second World War, when Amer. patrols met units of the 58th Russian Guards Div. on April 25, 1945. Pop. 13,550.

**Torhout** (Fr. *Thourhout*), city in the prov. of W. Flanders, Belgium, 12 m. S.S.W. of Bruges. 2 m. N.W. of T. lies the beautiful castle of Wijngaede, built in the eleventh century. In 1940 King Leopold III. had his H.Q. and capitulated here on May 28. T. is considered to be the oldest place in Flanders and once was the most important cloth-market of the country. Manufs. include linen, drainage pipes, and weighing-machines. It is an important horse-market. Pop. 12,200.

**Torino**, see TURIN.

**Tormentil** (*Potentilla erecta*), perennial herb (family Rosaceae), found in the Azores, W. Siberia and Europe. The leaves are divided into three, sometimes five leaflets; the flowers, which are yellow have four, sometimes five petals. The rootstock is used in tanning, having an astringent quality.

**Tornado**, cyclonic disturbance of the atmosphere, most common in U.S.A. E. of 100°W. long., but particularly in Kansas and Illinois. Usually it arises suddenly on a sultry summer afternoon in the transition zone between tropical maritime air from the gulf of Mexico and polar air that has become hot and dry over deserts. It is of small diameter, a few hundred yards, but of relatively great vertical height. The upper portion is marked by a swirling funnel-shaped cloud which sways and rises and falls and may reach the ground in the centre of the T. Local surface conditions give rise to rapid heating of a column of moist air by the sun, and sudden expansion takes place; it rises and condensing moisture adds to its temp. As it spreads out rain falls, which evaporates into surrounding dry air, cooling it and increasing the instability of the transition zone, causing, in its turn, more intense convection—a self-generating process.

The pressure in the centre falls and as the air is sucked in, it is whirled vortex-like in a cyclonic (anti-clockwise) rotation with stronger and stronger winds, sometimes reaching 200 m.p.h. The force developed cuts a clean path through tn. or country; trees are uprooted and whirled outside the track; houses are 'burst' by their own internal pressure as the low pressure passes; the damage to houses often leads to escape of gas and disastrous fires. The track extends usually for about 30 m., and the energy is dissipated in about an hr., although sev. have been observed at the same time. They also occur in W. Africa, where they are known by the same name, in India where they are sometimes known as 'Nor'-westers,' and in Australia where the name is 'Willy-willy.' A very destructive T. visited S. Wales in Oct. 1913, springing up near Merthyr-Tydfil and dissipating in Cheshire. A T. in Oklahoma on April

9, 1947, killed 167 people and caused damage to property of nearly \$10,000,000. From 1916 to 1947 the average yearly number of Amer. Ts. was 141, the average loss of life 235 and the average loss to property \$12,300,000. The waterspout (q.v.) at sea is a similar phenomenon.

**Toronto**, cap. of the prov. of Ontario, Canada, is in York Co., 1800 m. W. of the Atlantic Ocean on a bay on the N. shore of Lake Ontario, 330 m. N.W. of New York City, 333 m. S.W. of Montreal, and 238 m. E. of Detroit. The cross-roads of trade since Indian times, T.'s strategic position was fought for by Fr., Amer.,

the Customs Ports of Toronto in 1947 amounted to \$441,103,801: exports, \$8,603,767 (*Trade of Canada*, Vol. 1, Dominion Bureau of Statistics). In volume of trading T. Stock Exchange is the second largest in the world.

T. is served by municipally-owned water works, hydro-electric power supplied by Niagara Falls, gas works, electric street railways, trolley buses, and motor coaches, and has an airport. One of the world's great sports cities, it has four race tracks, a large baseball stadium, and one of the world's largest indoor sports arenas, Maple Leaf Gardens, in winter the T.



TORONTO: A VIEW FROM CENTRE ISLAND

and Eng. Its well-sheltered harbour, the finest on the Great Lakes, handled 4,310,900 short tons of water-borne trade in 1948. Co-ordinated water, rail, highway, and air transit services include two of the world's greatest railway systems, Canadian National and Canadian Pacific, buses, steamships, and Trans Canada and Amer. Airways air service to all parts of the world. A great commercial centre, it has the largest livestock mkt. in Canada, 3869 manufacturing estab. with gross value of products of \$1,188,751,064 (Dominion Bureau of Statistics, 1946), including meat-packing, electrical equipment, agric. implements, bakery products, clothing, furniture, automobile supplies, pianos, foundries, brewing, and distilling works. T. is the leading Canadian city in wages and salary payroll, bank clearings, postal revenue, telephone installations, and car loadings. Imports cleared through

home of Canada's national sport, hockey. The Canadian National Exhibition, largest ann. exposition in world, occupies in Aug. and Sept. a 350 ac., municipally-owned park on the shore of Lake Ontario, where the Royal Agric. Winter Fair, one of the three major livestock shows on the continent, is also held annually. A new rapid transit system to provide increased, speedy transportation in the form of modern subways, began in 1949 with the building of Yonge St. subway.

The Univ. of Toronto, founded in 1827, had 16,190 students (1948-1949), in Faculties of Arts, Science, Medicine, Music, etc., the chief colleges being Univ., Victoria (United Church), Trinity (Anglican), St. Michael's (Rom. Catholic), with federated theological colleges, Knox (Presbyterian), Wycliffe (Anglican), Emmanuel (United Church), and St. Michael's, with which is affiliated St. Michael's

Pontifical Institute of Medieval Studies, the only Institute in N. America empowered to grant Pontifical Degrees. T.'s School of Medicine has developed the Connaught Laboratories, and the Banting and Best Institute, named after the late Sir Frederick Banting and Dr. Charles H. Best, who discovered insulin in one of the most accurately planned scientific developments ever known, at the physiology laboratories at the Univ. of T. in 1921. T. hospitals include T. General, Sick Children's, and Sunnybrook, largest and most modern Canadian military hospital. T. is also the centre of Dominion Meteorological services. The Royal Ontario Museum, largest in the Brit. Commonwealth outside London, is famous for its Chinese collection. The Conservatory of Music, incorporated in 1886, passed under the trusteeship of the univ. in 1921 and was granted the title of Royal T. Conservatory of Music in 1946 on the occasion of its diamond jubilee. It is the dominant force in musical education in Canada. T. had its first full-size symphony orchestra in 1894, and now supports two symphony organisations, the T. Symphony Orchestra and the T. Philharmonic Orchestra. T. Art Gallery contains the second largest collection of Canadian paintings in the world. Other interesting buildings include the Prov. Legislative buildings, City Hall, Casa Loma, Bank of Commerce Building (tallest in the Brit. Commonwealth), Univ. Law, Legislative libraries, T. Public Library, with 17 branches and total circulation of 3,990,029 vols. (1918); St. James (Anglican) and St. Michael's (Roman Catholic) cathedrals, Metropolitan (United) Church, with its famous 52-bell carillon, the first tuned to the chromatic scale. 105 parks and playgrounds cover 2035 acs. of land and 159 acs. of water, including Exhibition, High, Riverdale, Queen's, Sunnybrook, Sunnyside, and T.'s island parks.

The site of the present city of T. was chosen by Lord Dorchester, governor of Canada, as the seat of gov. for the newly created prov. of Upper Canada in May, 1793. Sir John Graves Simcoe, first lieutenant-governor, named the new tn. York. It was occupied by United States forces in 1813, when legislative buildings and archives were burned and the mace carried away, to be returned by President Roosevelt at the centennial celebrations in 1934. Self-gov. was granted to the tn. of York in 1817; and it was incorporated as a city under the name of T. in 1834, with William Lyon Mackenzie as its first mayor. Its name, of Huron Indian origin, means 'a place of meeting.' Pop. 670,000: Greater T. including suburbs 1,030,000. See J. C. Dunt, *Toronto: Past and Present*, 1884; *University of Toronto History* (1925); *Toronto Municipal Handbook*, 1949.

**Torpedo**, or **Electric Ray**, genus of fishes, one of species of which (*T. hebelians*) is occasionally found off the coast of England. Ts. are characterised by the possession of an electric organ which is present between the head and the pectoral fin of each side. The shock which it is

capable of administering can disable a man.

**Torpedo**. In the days before the advent of the locomotive T., all submarine explosive devices, whether stationary or mobile, were referred to as Ts. These early Ts. were of many different forms; one type was towed across the bows of enemy vessels by small torpedo-boats (*q.v.*), another was the 'spar' T., which was carried on the end of a spar at the bows of a launch. The spar was arranged to lower the T. below the water-line just before striking, later models being fired electrically. As the result of equipping battleships with additional small guns and the installation of searchlights, the use of the above kinds of T. became a practical impossibility, and efforts were concentrated upon the development of a type which could drive itself. *Whitehead's* T. was constructed to ideas of Captain Luppiss of the Austrian Navy but was first practically evolved in 1866 by Whitehead, whose practical mechanical skill completely altered the original ideas. The first type was too uncertain in vertical direction, but the introduction of the 'balance chamber' in 1868 obviated the troubles of skimming and diving. The secret was purchased by the Brit. Gov. after successful trials, and in 1876 the servo-motor was added by Whitehead. Improvement continued, and to-day every navy uses the Whitehead T. in a highly-developed form, though there are many patterns.

The shape of the modern T. resembles a cigar with a rounded or blunt nose, upwards of 20 ft. long by as many inches in diameter and constructed of special steel. It is divided into a number of compartments: the explosive head, compressed-air chamber, balance chamber, engine room, and buoyancy chamber. In wartime about 500 lbs. of high explosive are stored in the head and are fired on contact with the target by means of an arrangement called a pistol, located in the extreme nose. The blow need not be directly head-on to detonate the charge, there being other side-projections capable of causing the explosion in the event of an oblique strike. To render the T. safe whilst being handled and until it is clear of the ship, there are three safety devices fitted, viz. a safety-pin which is first withdrawn; small vanes, so set that the rush of the T. through the water causes them to rotate and unscrew until they fall off; and lastly, the force of impact against the target must be sufficient to shear through another pin before finally the point of the striker fires the charge. For peace-time practice, special heads are fitted containing water and cork. The head is bolted on to the compressed-air chamber, which is forged from high-tensile steel and contains air at a pressure of over one ton per sq. in. supplied from air compressors on board the warship. Next follows the balance chamber containing the mechanism for controlling the depth the T. will run at, as well as, in the later types, vessels containing fuel, water, and a special heater apparatus. Depth control is effected by

a swinging weight or pendulum which, being affected by any alteration in tilt, sets in motion a servo-motor, contained in the engine room, which provides the necessary power to actuate the horizontal rudders which correct the vertical deflection of the T. from its proper depth. A hydrostatic valve is fitted to ensure that the T. attains the correct depth. The engines, placed abaft the balance chamber, are of the four-cylinder, single-acting, Brotherhood type and are marvels of ingenuity. Normally they are driven by compressed air, though in latest types fuel and air are burnt in a special generator and form steam which is led to the engines. The exhaust is allowed to escape and rises to the surface in the form of bubbles, making a track which can be clearly seen from the bridge of the ship attacked. Next comes the buoyancy chamber, whose primary purpose is to give the necessary buoyancy to the T. Herein is situated the gyroscope, which rotates at high speed, is delicately suspended in gimbals, and is connected to the vertical rudders. The gyroscope tends always to maintain the direction of its spinning axis, and this is used in conjunction with a servo-motor to actuate the vertical rudders and correct any deflection as soon as it occurs. At the tail are situated the vertical and horizontal rudders which keep the T. on its course and prevent it from sinking or jumping out of the water. Behind the rudders are situated two four-bladed propellers, driven by the engines, which rotate in opposite directions, thus preventing the T. from any heeling due to the torque reaction which would occur if only one screw were fitted. Exact details of the latest types are secret, but figures which have been pub. show that ranges exceeding 15,000 yds. and speeds of over 45 knots have been obtained. Efforts are being made to control them by radio.

T. tubes from which T.s are ejected are either submerged, as in submarines, or above water, as fitted in light cruisers and destroyers, and the firing impulse is given by compressed air or explosive. Another method of discharging them is by means of special dropping-gear from aircraft. The submerged tube has the advantages that the T. cannot be damaged by shell-fire when within the tube prior to discharge and that the moment of release cannot be detected by the enemy. In this type of tube the orifice can be closed by a watertight door, when a rear door may be opened to allow the T. to be placed in position. To fire, the rear door is closed, the outer door opened, and a blast of compressed air blows the T. out of the tube.

Modern battleships rely upon 'blisters' for protection against T.s. These are really an outer skin fitted below the water-line on the hull, and the space inside is utilised for carrying fuel oil. The T. explodes on striking the skin of the 'blister,' but no damage is sustained by the hull proper.

**Torpedo Boat and Torpedo Gunboat.** Both these types of craft are obsolete in modern navies having been replaced by

the destroyer (*q.v.*), and Motor Torpedo Boat. The earliest type of torpedo boat was merely a launch fitted with spar torpedoes; later the method adopted was to tow the torpedo across the bows of the enemy vessel. The first T. B. was built by Messrs. Thornycroft for the Norwegian Gov. in 1873, for the 'towing' type of torpedo. In 1879 the Brit. Admiralty had built the torpedo boat, *Lightning*, of 27 tons, 19 knots speed, and fitted with a bow torpedo tube for launching a locomotive torpedo of the Whitehead type. As time went on this class of vessel grew in size, speed, and armament and became a grave source of danger to battleships, necessitating other means of countering them than quick-firing guns and torpedo nets, particularly as torpedoes were fitted with net cutters. A special class of vessels, termed 'torpedo gunboats' or 'torpedo catchers,' was introduced to destroy the T. Bs. They were armed with 4-in. and 3-pounder quick-firing guns and, later, torpedo tubes, but were never successful, owing primarily to their lack of speed, and were entirely superseded by the torpedo boat destroyer, which was able to combine effectively the functions of torpedo boat and catcher.

**Torpedo Boat Destroyer**, see DESTROYER, TORPEDO BOAT.

**Torpedo Ejector, or Torpedo Tube**, see under TORPEDO.

**Torquatus**, name of a patrician family of the gens Manlia. *Titus Manlius Imperiosus* fought against the Gauls (361 B.C.), winning his name T. by taking the necklace (*torques*) from the body of a mighty Gaul slain by him in single combat. He was dictator 353 and 349, and consul 347, 344, and 340. With P. Decius Mus he defeated the Latins at the foot of Vesuvius. (See Livy, iv. 5, viii. 3-12; Cicero, *De Officiis*, iii. 31.). *Lucius Manlius* was a consul with Cotta (65 B.C.), and helped to suppress Catiline's conspiracy (63), and supported Cicero in his exile (58). *Lucius Manlius*, his son, was praetor 49 B.C., and opposed Caesar on the outbreak of civil war. Obligated to surrender Oricum, he was taken prisoner (48), but released. He fought again in Africa, but was captured and slain (46), on the defeat of the Pompeians.

**Torquay**, municipal bor., seaport and holiday resort of S. Devonshire, England, on Tor Bay, 26 m. S. of Exeter and 199½ m. by rail from Paddington (London). Its picturesque scenery and mild climate make it a favourite health resort. Terra cotta, clay, and marble are found in the neighbourhood of the tn. The Domesday survey identifies part of the site of T. with the Norman period, recording that William I. gave the manor of *Cockintone* (now Cockington) to a follower, Hostarius. But by far the earliest link with the past is Kent's Cavern, in the Ilsham valley, a cave which is earlier than any other known. A fine collection of the remains of extinct animals, which once frequented the cave and of the implements made by the men of the Old Stone Age, forms part of the exhibits at the Museum of the T. Natural



**Hist. Society.** In 1196 the Premonstratensian Order of White Canons founded Torre Abbey, the ruins of which together with the restored Monastic Barn and the Mansion House dating in some parts from about the fifteenth century are a conspicuous feature to-day on the sea-front. The development of T. as a modern seaside resort dates back to the end of the eighteenth century, when 'Tor Kay' or 'Tor Key' was no more than a cluster of fishermen's huts on the shore with the vil. of Tor (or Torre) about a m. inland. To deal with the threat of invasion by Napoleon, ships of the Fleet constantly used Torbay as an anchorage and houses were built on the shores of the bay for the accommodation of the wives and families of the officers. Of T.'s total acreage (6241) over one thousand ac. are occupied by parks, pleasure grounds and public gardens, with tennis courts, bowling greens, etc. Torbay, which is notable for its regattas, provides one of the best yachting courses in Great Britain and has been the scene of America Cup trials; the yachting events of the 1948 Olympic Games were contested in the bay. In the tn. hall there is a tablet in honour of Prof. Oliver Heaviside (q.v.), who lived here for a period of his life. Babacombe (q.v.), 2 m. N. of central T., on Babacombe Bay, is now part of the bor. of T. Cockington, an old-world thatched vil.  $\frac{1}{2}$  m. from T. railway station, has for long been part of the bor. Its little church, in its present form, is of the Norman period. In the neighbourhood of T. are traces both of Rom. and Saxon occupation. Pop. (estimated) 50,390.

**Torque Amplifier and Torque Converter.** It is often necessary for an operator to be able to rotate massive pieces of mechanism such as a rudder of a liner or the guns of a ship. The operator can only exert a feeble twist or torque on the controlling device fixed in his observation post, so that some intermediate mechanism is required to magnify or amplify this torque in order to perform the required operations. This intermediate mechanism is called a *torque amplifier* and the principle of its action is as follows. The operator applies a feeble torque to a control-shaft that causes friction bands to engage with two drums rotating in opposite directions. The bands also engage with a shaft connected to the mechanism to be rotated, and the magnitude of the torque applied to this shaft depends on the friction between the bands and the rotating drums. Hence the feeble torque provided by the operator controls the extent to which the bands are brought into contact with the drum, while the final torque applied to the mechanism depends on the speed of rotation of the drums.

The *torque converter* acts as an infinitely variable gear, usually with varying efficiency.

**Torquemada, Tomás de** (1420-98), Dominican friar b. at Valladolid, who in 1483 was entrusted by Queen Isabella with the estab. of the Sp. Inquisition. Ascetic in his private life, he was severe to the point of cruelty towards suspec-

ted or convicted heretics. Of 100,000 said to have been accused, 1000 were put to death, others fined and penanced. He was one of the leading instigators of the conquest of Granada and of the expulsion of the Jews. See W. T. Walsh, *Isabella of Spain*, 1937; E. Lucka, *Torquemada und die spanische Inquisition*, 1926; life by H. G. de Saint Amant, 1910.

**Torre, Duque de la, see** SERRANO Y DOMINGUEZ.

**Torre del Greco**, seaside resort and fishing tn. of Italy, in the prov. of Naples, situated at the foot of Vesuvius, which has often damaged the tn. by eruptions. It has shipbuilding yards, and exports cameos, worked coral, lava, etc. Pop. 61,000.

**Torrans, Lake**, large salt lake of S. Australia, discovered in 1840 by Eyre, 35 m. N. of Port Augusta. It is 40 m. N. of Spencer Gulf, in the N. part of the Great Valley and 80 ft. above sea level. Its average breadth is 20 m., length 130 m. It becomes a marsh in dry weather.

**Torreon**, tn. of Mexico, in the state of Coahuila, and standing 3800 ft. above sea level, 500 m. N.W. of Mexico City. It is an important railway junction, lines radiating to Chihuahua, Durango, Zacatecas, Fresnillo, and Monterrey. Its industries include cotton mills, smelting works, and flour mills, and there are coal and other mines in the dist. Pop. (including the nearby tns. of Ciudad Lerdo and Gomez Palacio), 87,800.

**Torres, Alciato Alcalá Zamora y, see** ZAMORA Y TORRES.

**Torres Strait**, in the S. Pacific Ocean, between New Guinea and Australia, from 80 to 90 m. broad. It contains sev. is., the chief of which are Clarence and Prince of Wales Is. Reefs and shoals abound, rendering navigation difficult.

**Torres Vedras**, tn. with a Moorish citadel, on the Sizandro, Portugal, 40 m. by rail from Lisbon. It was here that Wellington constructed the famous field-works known as the 'Lines of Torres Vedras' when he withdrew his forces in face of Masséna's invasion of Portugal, for the winter of 1810. Wellington's triple lines of fortifications, stretching to the Tagus, consisted of one hundred forts, joined together by entrenchments and inundations, and he successfully defended them until he was able to advance against Masséna and drive the Fr. back into Spain. T. V. is the centre of a vine-growing dist. and has sulphur baths. Pop. 8700.

**Torricelli, Evangelista** (1608-47), It. physicist, b. at Faenza. He acted as Galileo's secretary, and was prompted to many of his discoveries by the study of that scientist's works. Besides making a barometer—an invention commemorated in the names of Torricellian tube and Torricellian vacuum—he solved the problem of the quadrature of the cycloid. *Opera Geometrica* (1644) is his prin. work.

**Torridon**, hamlet at the head of Loch T., on the W. coast of Scotland, in Ross and Cromarty. There is a deer forest nearby.

**Torrington:** 1. Bor. on the Naugatuck R., in Litchfield co., Connecticut, U.S.A. Textiles, engines, and hardware are produced. Pop. 27,000. 2. Or Great T., a mkt. tn. and mun. bor., on the Torridge, in Devonshire, England. Its Saxon name was Tortione. The bluecoat school was estab. in 1671. There is a milk-canning factory, and gloves are made. Pop. 7500.

**Torrington, Viscount,** see BYNG, GEORGE.

**Torsion,** strain produced by a twisting motion, that is, by a couple acting in a plane at right angles to the axis of a prism. The distortion produced is a type of shearing stress. In the case of a cylinder the outer layers slide over the inner layers in the direction of the twist, so that, while the axis remains the same, the exterior takes on a screw-like appearance. Resistance to T. determines the rigidity of the bar, and resistance to permanent distortion depends upon its elasticity. The amount of 'torque' or twist required to produce T. in cylindrical bars of the same material varies as the fourth power of their diameters. In bars of section other than circular the rigidity is lessened, so that in practical application cylindrical bars are best adapted to resist a twisting strain.

**Tort,** (Lat. *tortus*, twisted), act or omission giving rise to a remedy by action for damages which is not an action for contract, e.g. trespass (*q.v.*), slander, libel, detinue (*q.v.*), negligence and nuisance (*q.v.*), and assault. A T. has some of the characteristics of a criminal offence, but is to be distinguished therefrom, though many crimes necessarily include a T. (e.g. a public nuisance causing special damage to an individual; rape), but every T. does not amount to a crime (e.g. slander and seduction are merely T.s.) nor does every crime amount to a T. (e.g. blasphemy and treason). Where the T. is punishable summarily and the magistrates dismiss the case, no further proceedings, criminal or civil, can be taken. A cause of action in contract may co-exist with a T., i.e. the same facts may give A a remedy in contract against B and also a remedy in T. against C, e.g. where A is injured in alighting on a defective wharf belonging to B shipping company, from a ship belonging to C shipping company which enjoys unloading rights on B's wharf (see Sir F. Pollock, *Law of Torts*, 1887); conversely there may be two causes of action, one in T. and one in contract with a common defendant; and generally, when a contract inevitably gives rise to duties independently of the contract itself, the breach of them often amounts to a T., e.g. where A purchases goods on credit from B, and B resells before A makes default in payment, A can sue B for conversion. Sir F. Pollock, *Law of Torts* (14th ed. by P. A. Landon), 1939; Sir J. W. Salmond, *Law of Torts* (10th ed. by W. T. S. Stallibrass), 1945; P. H. Winfield, *Cases on Law of Torts* (3rd ed.), 1945; and G. F. Clerk and W. H. Lindell, *Law of Torts* (10th ed.), 1947.

**Torticollis,** see STIFF NECK.

**Tortoise,** name for all the land Chelonians, and often applied to all members of

the family Chelonia with the exception of the marine Chelonians or turtles. All members of the order are cold-blooded, four-footed reptiles, without teeth, and are protected by a shell, or leathery case. All lay eggs, but otherwise there is wide diversity in their habits. They are of great geological age, and their tenacity of life has enabled them to survive where more recent animals of higher types have become extinct. The most familiar example of the land Ts. (*Testudines*) is the common or Gk. T. (*Testudo graeca*) which occurs around the Mediterranean and is much kept as a pet. It is entirely vegetarian in its diet, though frequently sold as an insect killer. Another T. which is sometimes offered for sale is the riv. T. (*Emys europaea*); this is a type of the riv. and marsh Ts. (*Emydes*) and is distinguished by its small yellow spots; this eats insects, worms, etc. Among the mud or soft Ts. (*Trionycides*) are various Amer. and Indian species which are frequently killed for food, the flesh being well flavoured. The most important of the turtles (*Cheloniades*) are the edible green turtle (*Chelonia mydas*) and the hawksbill turtle (*C. imbricata*), from which tortoiseshell is derived. Among the most interesting kinds of T. are the Gigantic Ts. formerly found in great numbers in the Galapagos and Mascarene Is. When discovered these is. were uninhabited; the Ts. therefore enjoyed perfect security, and this, as well as their ordinary longevity, accounts for their great sizes (as much as 5 ft. in length) and numbers.

**Tortoise Plant,** see TESTUDINARIA.

**Tortoise-shell,** in commerce, is the horny plates of the hawksbill turtle (*Chelonia imbricata*). The largest of these plates are about 18 in. long by 6 in. broad, and rarely exceed one-eighth of an in. in thickness. T. is semi-transparent, and mottled with various shades of yellow and brownish-red. Its value depends on the brightness and form of the markings, and, if taken from the animal after death and decomposition, the colour of the shell becomes clouded and milky. Hence great cruelty has been exercised in removing the plates from living turtles, but the finest T. is derived from shells immersed in boiling water immediately after the death of the animal. Numerous imitations and substitutes are made. T. is used for making combs, snuff-boxes, and a number of fancy articles, as a material for inlaying ornamental furniture, as a veneer, and as a ground substance in which the precious metals and mother-of-pearl are inlaid.

**Tortola,** see VIRGIN ISLANDS.

**Torture.** The application of bodily pain in order to extort evidence from witnesses or confessions from accused persons has been a feature of almost every judicial system of the world. In England the practice was virtually abolished in 1640. T. was abolished in France at the Revolution (1789); in Scotland by an Act passed in 1709. It was unknown in the Ger. municipalities until the end of the fourteenth century, but once introduced it remained lawful (though only intermittently resorted to after 1750) in

Hanover, Bavaria, and some of the smaller Ger. states until the first decade of the nineteenth century, while in Austria, Prussia, and Saxony it virtually ceased in 1750, and in Russia was finally abolished in 1801. Ingenious forms of T. were used by the Jap. and Gers. in the Second World War, in occupied countries and against resistance movements. The customary modes of T. were the rack, wheel, and thumb-screw, although in England in earlier times it was inflicted by the boot, by fire or water, and by *peine forte et dure*, i.e. by piling weights on the prostrate body of the victim.

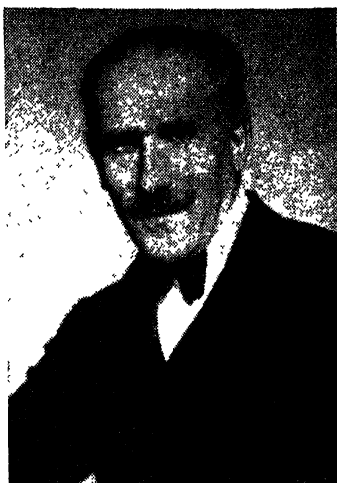
**Toru Dutt**, see DUTT, TORU OR TARULATA.

**Torula**, see YEAST.

**Torun**, or **Thorn**, tn. on the Vistula, 6 m. E.S.E. of Bydgoszcz in the prov. of Pomorze, Poland, formerly in E. Prussia, Germany. Pop. 54,000.

**Tory**, synonym, though historically inappropriate, for a Conservative. The word T. is Irish, and signified, during the time of the wars in Ireland in the reign of Elizabeth, a kind of robber who, being attached to neither army, preyed generally upon the country without distinction of Eng. or Spaniard. They were especially prominent in the Protestant massacres of 1611. From this the term came to be applied to a body of men who, in 1680, appear to have ridiculed the Popish Plot and yet encouraged the Papists to revive it. Their political object was to banish the duke of Monmouth and recall the duke of York, and to further their end they endeavoured to thwart the Bill of Exclusion (from their abhorrence to which they were called 'abhorers' and their opponents the 'petitioners'). Ultimately the 'abhorers' and 'petitioners' became identified with the terms Tories and Whigs respectively. See *Edinburgh Review*, vol. I., 1830. See further under CONSERVATIVE PARTY; PARTY GOVERNMENT.

**Toscanini, Arturo**, (b. 1867). It. conductor. b. at Parma. He studied at the Parma Conservatory, where he gained his diploma in cello and composition in 1885, and began his career as a conductor in 1886 at Rio de Janeiro. His reputation rapidly gained ground. In Turin, where he remained for sev. years, he directed the first performance in 1886 of Catalini's *Edmea*. In 1898 he was appointed to La Scala, Milan, and in 1907 nominated conductor of the Metropolitan, New York. He returned to La Scala in 1921. He was conductor of the Philharmonic Symphony Society of New York, 1926-36. His chief centres of activity have been the oper. houses and concert halls of Milan and New York, but he has been guest conductor at Vienna, Salzburg, Paris, and elsewhere. He conducted at Covent Garden during the Coronation celebrations of George VI., 1937. In 1946 he returned to La Scala. The concerts conducted by him in the Augusteo in Rome have become memorable. Many new It. operas were presented by T. See lives by G. M. Ciampelli, 1923; T. Nicotra, 1929; P. Stefan, 1936; S. Zweig, 1937; and L. Gilman, 1938.



Press Portrait Bureau

ARTURO TOSCANINI

**Tosti, Sir Francesco Paolo** (1846-1916). It. composer, b. in the Abruzzi. He came to London when about thirty years old and held the position of singing teacher at the R.A.M. In 1885 he was knighted by Queen Victoria, with whom he was a favourite composer. His early work recalls the folk-songs of his native Abruzzo. He was singing-master to the Queen of Italy and later to the Brit. Royal Family, and settled permanently in London. He composed hundreds of songs, 'Goodbye' being probably the favourite in a mass of work which achieved great popularity.

**Tostig** (d. 1066), earl of Northumbria, was the son of Karl Godwin. In 1065, he was banished from his realm because of his cruel, repressive measures. The following year he returned with Harald, king of Norway, and was slain at Stamford Bridge by King Harold.

**Totalisator**, machine, or apparatus, set up on race-courses for recording bets and payment of winnings on the principle that all money staked is pooled and shared (subject to a percentage deduction) by those who have backed winners. This system, known as the *pari-mutuel*, was invented in France by M. Oller in 1872. The first machine used to operate this system was set up at Christchurch, N.Z., in 1880, and the first T. in Europe was operated at Longchamps, near Paris, in 1929. Ts. were introduced into Britain in the same year, and by the end of 1930 ninety-two race-courses were provided with T. facilities. They were also in the same year installed at many greyhound tracks. A mechanized *pari-mutuel* system was operated in Maryland, U.S.A., in 1930.

In Great Britain Ts. are operated on horse-racing courses by the Racecourse

Betting Control Board, constituted under the Racecourse Betting Act, 1928, with a view to benefiting, by the legislation and estab. of Ts. on race-courses in Great Britain, the horse-breeding industry, the sport of horse-racing, and charities. Under the Betting and Lotteries Act, 1934, veterinary science also benefits. The Board's income is derived by a deduction of ten per cent from the moneys staked, and these earnings are paid into a 'T. fund.'

On a fully mechanised installation, at the time of the issue of the tickets, each 2s. unit is automatically added and recorded on a miniature indicator in the control room and simultaneously indicated to the public on the main indicators. The prices of tickets on a race-course are 2s., 10s., £1, £5, and on some race-courses, £10 and £100. Facilities also exist for 'off-the-course' betting. T. betting represents only a small proportion of off-course betting on horse-racing, whereas it represents a larger proportion of on-course betting. The amount staked with the T. on horse-racing between 1929 and 1949 was £165,753,635, the average over the last four years being £22,000,000 a year, the peak year being 1948 with £26,252,615. Two representatives each of the secretary of state for the Home Dept. and the National Hunt Committee, three from the Jockey Club and one representative each of the secretary of state for Scotland, the chancellor of the exchequer, Tattersall's Committee, the minister of agriculture and fisheries, and the Race-course Association, Ltd., form the Race-course Betting Control Board. As regards greyhound racing about sixty per cent, or over 300 tracks are equipped with Ts. The average amount staked per year during 1945-48 was £142,000,000, the peak year being 1946 with £199,000,000. For discussion of T. and *pari-mutuel* systems, see under BETTING.

**Totalitarian Government**, see under GOVERNMENT.

**Totemism**, belief prevailing among primitive peoples of blood-kinship with or descent from an animal or plant. The word is derived from the Algonquin Indian *otem*, a totem or guardian spirit, or rather from that form of it, *totem*, signifying 'my otem' or guardian spirit (pronounced *odaim* and *todaim*). T. is at the root of nearly every mythology, and accounts for such mythological phenomena as the animal-headed gods of Egypt, which were merely anthropomorphic totems in a state of high evolution. The system was certainly in vogue among the anc. Britons, Hebs., Gks., and many other European and Asiatic peoples, and still is so among, notably, the N. Amer. Indians and Australian aborigines. In sev. Indian 'nations' each individual of a tribe possesses a personal totem which he receives in a dream induced by drugs or hunger at the age of puberty. The idea of blood-kinship among the members of a totem tribe renders it incestuous for its members to intermarry, so that they are compelled to find spouses from another community. Hence also it is regarded as

being wrong to kill a blood-brother. Indeed the results and vestiges of T. may be remarked as still existent among our modern institutions. See E. B. Tylor, *Primitive Culture*, 1871; A. Lang, *Secret of the Totem*, 1905; Sir J. G. Frazer, *Totemism and Exogamy*, 1910; Lord Avebury, *Marriage, Totemism and Religion*, 1911; S. Freud, *Totem and Tabu*, 1913; W. Schmidt, *Origin and Growth of Religion*, 1930.

**Totila** (d. 552), king of the Ostrogoths in Italy, was proclaimed in 541. He at once commenced the restoration of the kingdom of Italy and gained a victory over the Romans near Faenza. Continuing his victorious march towards Rome, he besieged that city in 546, and captured it the same year. In 547 Bellisarius recovered possession and repulsed three assaults of T., who did not succeed in retaking the city till 549. Owing to T.'s continued successes the Emperor Justinian sent a large army against him, led by the eunuch Narses, who encountered T. at Taginae, defeated, and slew him. See F. Dahn, *Könige der Germanen*, 1861-1911; and L. M. Hartmann, *Geschichte Italiens im Mittelalter*, vol. 1, 2nd ed. 1923.

**Totnes** (the *Tolensis* of Saxon times), anc. mkt. tn., with cider breweries, a milk factory, sawmills, and timber-yards, on the Dart, in Devonshire, England. The grammar school was founded in 1551. There is a Norman castle, and the Guildhall dates from 1555. Pop. 5700.

**Tottenham**, bor. of Middlesex, forming part of Greater London, an industrial and residential dist. The area is 3014 acs., and the pop. (estim. 1916) 129,000. See W. Robinson, *History of Tottenham*, 2nd ed., 1840.

**Tottington**, urb. dist. of Lancashire, England, 2½ m. N.W. of Bury. Its industries are cotton-spinning and production of rayon silk. Pop. 6000.

**Toucans**, popular name of any bird of the genus *Ramphastos*, often applied to the whole family *Ramphastidae*. They are all natives of tropical America and are characterised by their enormous bill and by their habit of bringing up their food after swallowing it in order to masticate it. In confinement they are almost omnivorous, but in a wild state they live chiefly on fruit. In the true Ts. the ground colour of the plumage is generally black; the throat, breast, and rump adorned with yellow, red, and white; the body is short and thick; tail rounded or even and capable of being turned up over the back when the bird goes to roost.

**Touch**, sensation due to the stimuli of pressure and contact acting on the body. There are two components of this sensation, one of simple pressure, and the other of the locality or region of application of the pressure. Sensitivity to pressure may be estimated by the ability to perceive the pressure due to small weights, from two to fifteen milligrams, on various parts of the body. Results show that the sensitivity of these parts varies considerably, parts of the face being most sensitive. Ability to perceive locality is measured by the

minimum distance separating the two slightly blunt points of dividers when they can be felt as two separate points. In parts of the back, forearm, and thigh, the two points are felt as one, even when they are 2 in. apart. The tip of the tongue is most sensitive to locality, points 1 millimetre apart being distinguished separately. The peripheral nerves supplying the skin terminate either on or between epithelial cells, or in special corpuscles. Certain of these have long been regarded as tactile organs, but there is conflicting evidence with regard to this view. Although careful experiment has failed definitely to establish the connection of the corpuscles and the sensation of T., results seem to indicate that T. must be due to special nerve endings probably associated with the corpuscles. Like all other sensations, that of T. is perceived by the brain, and is conveyed to it by afferent nerves or fibres which travel in special tracts of the spinal cone, distinct from those conveying impulses of pain. Consequently in *syriung-myelia*, when the sensation of pain is lost, that of T. is unimpaired. (See NERVOUS SYSTEM.)

**Touch-Me-Not**, see under BALSAM.

**Touchstone**, mineral (schist or jasper) used for testing the purity of gold and gold alloys, which gave characteristic streaks when rubbed over it. The test is probably over 2000 years old, and is still used. T. is also known as basanite and Lydian stone.

**'Tough School'**, see under HEMINGWAY, ERNEST.

**Toul**, fort tn. in the dept. of Meurthe-et-Moselle, France, on the Moselle, in a plain almost surrounded by mts. Its fine old cathedral (now the church of St. Etienne) was begun about 965 and took five centuries to build. It capitulated to the Gers. during the Franco-Ger. war of 1870. In the Second World War T. suffered much damage. Pop. 12,700.

**Toulon** (anc. *Telo Martius*), naval and military port and fortress of the dept. of Var, France, on a bay of the Mediterranean. Next to Brest in Finistère it is the chief naval station and arsenal of France. The commercial port and tn. are on the N.E. side of the inner harbour. T. contains a medieval cathedral, a torpedo station, a naval hospital and schools, extensive docks and arsenal, the Musée Bibliothèque, and a convict prison. Trade is not important, but wine, brandy, oil, and fruits are exported. Since 1912 T. has replaced Marseilles as the port of call for the Orient Steam Navigation Co.'s steamers to Egypt, Colombo, and Australia. Its original dockyards and arsenal were begun by Vauban in the seventeenth century, but destroyed by the Brit. to whom T. was yielded (Aug. 1793), being retaken by the Fr. republicans (Dec. 1793). Napoleon first won military fame during this memorable siege. In 1911 the Fr. battleship *Liberté* caught fire and was blown up in T. harbour; many ships near by were damaged and about 200 people perished.

In 1942 the bulk of the Fr. fleet was

scuttled in T. harbour to prevent it falling into Ger. hands. Subsequent Allied bombing almost completely destroyed the harbour and installations. T. was liberated by Fr. troops in Aug. 1945. Pop. 125,800.

See G. Lambert, *Histoire de Toulon*, 1886-92, and J. H. Rose, *Lord Hood and the Defence of Toulon*, 1922.

**Toulouse, Count of**, see RAYMOND.

**Toulouse**, cap. of the dept. of Haute-Garonne, France, lies on the Garonne. The riv. is spanned by the beautiful Pont-Neuf (1543-1626), which connects the city with St. Cyprien, its suburb. The Canal du Midi makes broad curves on the N. and E. The church of St. Saturein is a splendid Romanesque basilica. The cathedral, a structure of many periods, contains the tombs of the counts of T. Noteworthy are the historic Capitole, the thirteenth-century brick church of the Jacobins, the Hôtel Bernuy, and the Musée with its unique collection of antiquities. The city is an archbishopric and the seat of a univ. (8000 students), founded in 1230. Besides a brisk commerce in corn, wine, and horses, all kinds of commodities, from steam engines to truffle pies, are manufactured. The national tobacco factory is here. In Rom. times the tn. was called Tolosa, and it was ruled by counts from 778 to 1271. At T. was fought the last action of the Peninsular War, on April 10, 1814, the battle being fought, and a somewhat doubtful Brit. victory gained, without knowledge that Napoleon's abdication had already taken place. Pop. 264,400. See J. de Lahoudès, *Les Monuments de Toulouse*, 1924.

**Toulouse-Lautrec-Monfa, Count Henri Marie Raymond de** (1864-1901), Fr. painter; b. at Albi. He travelled widely, but most of his life was given up to the bohemian and artistic society of Paris which he depicted in his paintings, representing the behaviour of both the aristocracy and the *demi-monde*. 'La Goulue et sa Sœur', 'Messalina', 'Femme au Chien', and 'A la Mie' are among his best works, which included drawings, posters, etchings, and lithographs as well as oils.

**Touraco**, or **Touracou**, beautiful African bird of the genus *Corythae* of the family *Musophagidae* or plantain-eaters. The T. has a small high bill, notched and serrated mandibles, short rounded wings, and a long rounded tail. It has an erectile crest on the head. The plumage is green, with purple on the wings and tail. The Ts. comprise over a dozen species, including the *T. persa*, with purple wing coverts, found on the Guinea Coast, and *T. albicristatus* or white crested T. of Cape Colony.

**Touraine**, prov. of anc. France, corresponding in the main to the present dept. of Indre-et-Loire. Its cap. was Tours, and it was named from the Gallic tribe of the Turones, who settled here. It was ruled by the counts of T., being joined with Anjou in the seventeenth century. At the Revolution it became the dept. Indre-et-Loire and part of Vienne. See A. Macdonnell, *Touraine and its*

*Story*, 1906; and A. H. Brodrick (ed.), *Touraine, with Anjou and Maine*, 1948.

**Tourcoing**, tn. in the dept. of Nord, France, 9 m. N.E. of Lille. It has been an important textile manufacturing centre since the twelfth century. Other manufs. include carpets, hosiery, and machinery. T. was the scene of a Fr. victory over the Austrians in 1794. Pop. 76,000.

**Tourism**, the organisation of sightseeing (q.v.), the emphasis being on travel and accommodation, and from this side only do the profits of tourist agencies accrue. See next article.

**Tourist and Holidays Board**, British, non-governmental organisation set up by the gov. in Jan. 1947, to foster and develop the tourist, catering, and holiday services. After adverse criticism by the Catering Wages Commission and the House of Commons Select Committee on Expenditure, the Board and the Brit. Travel Association were merged as the Brit. Travel and Holidays Association.

**Tourmaline**, mineral of variable composition, containing silica, aluminium, sodium, iron, magnesium, boron, etc. It crystallises in the hexagonal system, and has a rhombohedral cleavage. It also occurs massive and compact and in radiate fibrous masses. In colour it is generally black, more rarely green, blue, and red, and, still more rarely, colourless. The black variety is termed schorl (q.v.). The mineral is diatomic, brittle, and pyroelectric. On account of its hardness (hardness 7.5; sp. gr. 3) it is sometimes cut as a gem. Varieties of T. are rubellite (red or pink), indicolite (indigo blue), Brazilian sapphire (Berlin blue and transparent), Brazilian emerald (green), and peridot of Ceylon (yellow). T. occurs in granite, gneiss, mica, and chlorite slates and granular limestones; it is found in Cornwall and Devon, Bavaria, and Switzerland. The rubellite variety, used as gems, is found in Ceylon, Siberia, and Ava. The clear transparent varieties are used for making polariscopes and polarimeters, e.g. the 'T. pincette'.

**Tournal** (Flemish **Doornik**), Belgian city and important railway junction, situated on the Scheldt, in the prov. of Hainaut, 27 m. W.N.W. of Mons. Of all the Belgian tns. T. suffered most during the Second World War. Many houses, medieval churches, and municipal buildings, and the valuable library were destroyed. The fine Romanesque and Gothic cathedral, built from the eleventh to the fourteenth century, however, and the Belfry, the oldest in the country, were hardly damaged. There are quarries of freestone and limestone, and the chief manufs. are Brussels carpets, pottery, and woollen and cotton goods. Pop. 32,300.

**Tournament**, **Tourney**, or **Joust**, form of martial sport very popular in the Middle Ages. Combats took place on horseback between men of noble rank, and a prize was given by the lady of the T. to the knight who had displayed the greatest prowess. The invention of this particular form of military display was ascribed by Ruexner to Henry the Fowler (d. 936) and by others to Geoffroi de Prouilly

(d. 1066). The custom was introduced into England from France during the eleventh century. Ts. were regulated by definite rules and by very strict etiquette. The weapons used, spears, lances, swords, or daggers, had to be blunted. Each joust was attended by his squire, who acted as his second and could alone touch him if he fell. In spite of precautions, however, accidents and rough dealings were not infrequent. See Froissart's *Chronicles*, Scott's *Ivanhoe*, and F. H. Cripps-Day, *History of the Tournament*, 1918.

**Tournefort**, **Joseph Pitton de** (1656-1708), Fr. botanist, b. at Aix, Provence. Was appointed prof. of Botany at the Jardin des Plantes in 1683. His *Éléments de Botanique* (1694), embodies a systematic arrangement of some 8000 species of plants, classified, mainly, according to the corolla, a system for long adopted on the Continent. But his chief work was his *Institutiones Rei Herbariae* (3 vols. 1700), which certainly prepared the way for Linnaeus, whose system of classification eventually superseded that of T.

**Tourneur**, **Cyril** (1575-1626), Eng. dramatist, b. and educated at Westminster, and Trinity College, Dublin. He spent much of his life soldiering (1600-07, 1613-26), being engaged in 1625 by the Low Countries which he served as secretary of the War council. He accompanied Sir Edward Cecil's expedition to Cadiz, and died on his return at Kinsale, Ireland. In the six years which he devoted to literature T. was a prolific writer. He wrote the *Atheist's Tragedy*, 1611, *Transformed Metamorphosis* which was discovered only in 1872, and a lost play, *The Nobleman*. T.'s masterpiece is the *Revenge's Tragedy*, 1607. If it is true that T., unlike Shakespeare, was concerned rather with the technique of horror, physical, and mental, than with psychological issues, it must be emphasised that, like Shakespeare, he sought to 'hold the mirror up to nature'; and he was perhaps the first Eng. writer to display the 'indifference' exemplified by Tolstoy and his view that 'Man will become better only when you make him see what he is like.' Eng. drama owes much to T. for the admirable construction of his work, free from mannerism and bombast. His works were ed. by J. C. Collins in 1878; his two chief plays are reprinted in the Mermaid series and the *Revenge's Tragedy* in the Temple Dramatists. There is an ed. of his complete works by A. Nicholl (1930). See A. C. Swinburne in *The Age of Shakespeare*, 1908; T. S. Eliot in *Elizabethan Essays*, 1934; and U. M. Ellis-Fermor, *The Jacobean Drama*, 1936.

**Tourniquet**, instrument for preventing hemorrhage by compressing the main artery of a limb. The usual form consists of two metallic plates, united by a thumb-screw, and a strap provided with a pad. The instrument is applied so that the pad is opposite the artery to be compressed, while the strap encircles the limb. By turning the thumb-screw the two metallic plates are gradually separated, so that the strap is drawn more tightly round the

limb. A simple form of T. for first-aid purposes may be contrived by tying a triangular bandage about the part, introducing a stick between limb and bandage, and twisting until the required compression is obtained.

**Tours**, cap. of the dept. of Indre-et-Loire, France, 146 m. S.W. of Paris by rail. There are printing works, and silk (the industry was estab. by Charles VII.), stained glass, sweet, and automobile factories, etc., besides a considerable traffic in wine and brandy. A great agric. fair and exhibition is held here annually. T. is the seat of an archbishop, and boasts an historic cathedral of St. Gatien, the apostle of the Gauls, in which the gradual progress of architecture from 1170 till 1547 may be traced. A fifth of the tn. was destroyed or gravely damaged in the Second World War, the cathedral being partly destroyed. The *Cesaronum* and later the *Civitas Turonorum* of the Romans, it was the scene of the ministrations of St. Martin and St. Gregory (*q.v.*), the cap. of Touraine, and the bp. of Balzac. *See* A. H. Brodriel (ed.), *Touraine—with Anjou and Maine*, 1948. Pop. (tn.) 80,000 (arron.) 218,000.

**Tours, Battle of**, *see* CHARLES MARTEL. **Tourville, Anne Hilarion de Contetin, Comte, de** (1642-1701), Fr. admiral and marshal of France, b. in Normandy, distinguished himself in the battle of Palermo against the combined fleets of the Dutch and Spaniards (1676). But his most famous victory was won in 1690 off Beachy Head against the Dutch and Eng.

**Toussaint, Anna Louisa Geertruida**, *see* BOSBOOM.

**Toussaint L'Ouverture, Pierre Dominiq**ue (1746-1803), Negro liberator of Haiti, b. in Haiti, son of a chieftain of Guiaou-Guionou W. Africa, whom slave-traders captured and brought to Haiti. He was baptised and learned to read. He read and was markedly influenced by the Abbé Raynal's *Philosophical and Political History of the European Establishments and Commerce in the Two Indies*, where it was emphasised that the slaves were treated worse than dogs. Having joined the rebels, he soon acquired a magnetic hold over the negroes; his literacy lent him prestige, his knowledge of plants the reputation of a witch doctor, his dignity of bearing commanded their respect, and by 1791 he was their leader. T. and his army, then 6000 strong, allied themselves with Spain and carried out a lightning campaign.

In France, with the progress of the revolution of equality, came a change of heart towards Haiti and three delegates from the ls. now took their seats in the Fr. National Assembly (1793), while slavery was declared abolished. Thus T. was now able to lead his fellow negroes under the banner of the Fr. Republic against both the Sp. and the Eng., the latter having intervened on behalf of the white planters. Though without military allies, and alone he fought the Eng., who sustained their worst defeat for many years and soon had to yield all the posi-

tions they had won. T. entered Port-au-Prince in triumph.

In France reaction now set in. Vau-bianc, in the Convention, demanded that help be given to the whites against the aggression of the negroes, but T. defeated both the mulattoes under Rigaud and the Sp. During 1801-02 T. was the ruler of the whole ls., and began to reorganise the administration in the Sp. colony, as he had done in Haiti.

At this point, however, Napoleon intervened in an attempt to recover the slaves to their former bondage and T. then took up arms against his former Fr. allies. T. refused to negotiate with Napoleon's commissioner, and stipulated that he himself should be made governor of Haiti for life. Napoleon retorted by making extensive preparations for war. Following the Pounce of Amiens (1802), Napoleon openly announced an expedition against Haiti, whose slaves had 'flouted France's authority.' In the end T. could not rely on his general staff, and had no choice but to accept peace. He was inveigled into pourparlers with the Fr. leaders and at once put on board a frigate for France. There he was confined in the castle of Joux. Through the studied neglect of his jailers he died there in less than a year.

*See* S. Alexis, *Black Liberator: The Life of Toussaint L'Ouverture* (trans. by W. Stirling), 1949.

**Tout, Thomas Frederick** (1855-1929), Eng. historian, b. in London. Educated St. Olave's School, Southwark, and Balliol College, Oxford, he became prof. of hist. at St. David's College, Lampeter, 1881-90, and at Manchester Univ., 1890-1925. He was president of the Royal Historical Society, 1925. His works include booklets on medieval subjects, and many articles in *Dictionary of National Biography*. *See also* his *Collected Papers* (1932-34). *See* memoir by F. M. Powicke, 1931.

**Tovey, Donald Francis** (1875-1940), Eng. composer, pianist, and conductor, b. at Eton. From early childhood he was associated with Joachim (*q.v.*), who took a great interest in his musical education. T. entered Balliol College, Oxford, in 1894, as the first Lewis Nottleship Scholar, and studied composition under Sir Walter Parratt and Sir Hubert Parry. In 1900 he gave concerts in London, Berlin, and Vienna, and from 1914 was held Prof. of Music at Edinburgh Univ. being then the youngest prof. of Music in any Brit. univ. His work as a conductor, which was often marred by eccentricity, was in connection with the Reid Orchestra, Edinburgh, founded in 1924. T.'s music is distinguished by high and serious aims with much regard for classic form and style, and as a pianist he was for some time in the front rank, his interpretations of Bach, Beethoven, and Brahms being of value. As a teacher of music he was regarded with the greatest esteem. He wrote forty articles for the eleventh ed. of the *Encyc. Brit.*, and others, on Brahms and Haydn, in *Cobbett's Cyclopaedic Survey of Chamber Music*; *A Companion to Beethoven's piano sonatas* (1931), and *A Companion to Bach's Art of Fugue*

(1931), and studies of Schubert (1927), and Gluck (1934), in H. Foss's *Heritage of Music*. His *Essays in Musical Analysis* (6 vols., 1935-38), were notes for performances by the Reid orchestra. See also his *Essays and Lectures on Music* (ed. by H. Foss), 1950.

**Towcester**, mkt. tn. of Northamptonshire, England, 8 m. S.S.W. of Northampton. The chief industry is brewing and there is also an agric. trade. T. is on Watling Street and was known to the Romans as *Lactodorum*. It has an anct. par. church at which Archdeacon Wm. Sponne (*d.* 1449) was rector for twenty-eight years, during which time he founded the grammar school and a chantry which are still in existence. Sponne bought an old hostelry, then known as the 'Tabard inn,' together with its lands, and devoted the revenues from the property to the needs of the par. In the seventeenth century the name of the inn was changed to the 'Talbot hotel' on account of its associations with the earls of Shrewsbury. Pop. 3000.

**Tower Bridge, The**, only bridge over the Thames below London Bridge, built in 1886-94. It was designed by Sir Horace Jones and Sir J. Wolfe Barry and it cost the city corporation £1,500,000. It has two high Gothic towers 200 ft. apart and is connected with either bank by single-span suspension bridges. The span between the towers in the centre of the river consists of a pair of drawbridges, or bascules, which can be raised in 14 min., each half pulling up against its tower to permit the passage of vessels, whilst high up near the top of the towers there is a permanent suspension-bridge for pedestrians, which, however, is no longer open.

**Tower and Extending Ladders.** A ladder is a set of steps or rungs between supports, usually made of wood, but sometimes of metal or rope. Ladders were originally used in the anct. world e.g. for embarking or disembarking from the stern of a ship, or, fixed to a wheeled platform, as an *escalade* for siege work. A simple form of E. L. is the scaling-ladder (*q.v.*) which consists of two or more loose sections, each of which fits into the other. Other types of ladder are the wheeled tower ladder for (e.g.) inspection of street lamps, and the self-supporting steelback ladder for use when the surface of a building is not to be touched. For fire 'escapes' and turntable ladders, see *UNDER FIRE BRIGADES AND FIRE FIGHTING*.

**Construction.**—The construction of a telescopic extending ladder, which is typical, is here described. The stiles of a ladder are of two kinds: deal sides cut from deals, or pole sides, formed by cutting straight fir-pole in half and using one half for each side. Douglas fir is also used for stiles at the present time; oak and ash are employed for the rungs or rounds. Stile-lengths, having been brought to the correct size are 'paired-up,' so that stiles with the same grain tendencies are matched together. Stiles are then mortised for fitting with oblong rungs or drilled for round rungs, and are next grooved to take a wire reinforcement.

Stiles and rungs are then glued or wedged together. To rebate the wire into the grooves the ladder is 'bent' at the centre with weights and a tautened rope, the wire is fixed to one end of the stile and held away from the groove by draw-arms; the rope and weights are released at the centre and the wire allowed to fall into the grooves.

**Tower Hamlets**, before 1918, a parl. bor. of E. London, returning seven members. The divs. were Bow and Bromley, Limehouse, Mile End, Poplar, St. George Stepney, and Whitechapel.

**Tower of London.** The official title of the Governor as 'Constable of the Royal Palace and Fortress of London' emphasises the fact that the Tower is the Castle of London. Since the time of its earliest building on Thames-side by William the Conqueror to protect as well as control the city it has served as a Royal Palace (until the reign of James I.); a prison; a fortress, though it has never had a major siege; and at various times it has served as the Royal Mint, the Royal Observatory, the Royal Menagerie, and as a repository for State Documents. At the present day it still serves as an occasional prison for those convicted of treason, but it is chiefly important as a national 'sight,' and as the home of the Crown Regalia in the Jewel House of the Wakefield Tower. It is also a military barracks.

The original building stood within the Rom. city, and it was extended beyond the Wall in the twelfth century. A piece of the Rom. Wall may still be seen close to the White Tower. The T. of L. consists of three parts, as did most castles of importance. The Great Keep, or White Tower, has very thick walls, 15 ft. at the base, and is rectangular in plan. It was commenced about 1078 by Gundulph, a famous military architect, afterwards bishop of Rochester, and contains the Chapel of St. John built of Caen stone in a very severe style with little ornamentation. The W. T. contains a magnificent armoury, well displayed. The Inner Wall had a strong curtain-wall within defensive towers, twelve of which (Bell, Beauchamp, Devereux, Flint, Bowyer, Brick, Martin, Constable, Broad Arrow, Salt, Lanthorn, and Wakefield Towers) still survive. The Outer Ward has lofty defence walls provided with towers and casemates. Traitors' Gate is the chief riv.-gate; above it is St. Thomas's Tower, built in 1242. As an outer defence, there was a wide moat (now dry), but formerly kept filled by the Thames. The whole building is of great interest and has unrivalled historic associations. The Wakefield Tower, built by Henry III., saw the trial of Anne Boleyn. In the Bloody Tower were murdered the duke of Clarence, and allegedly the boy King Edward V. and his brother the duke of York. Many prisoners in the Beauchamp Tower, built in 1300, have left carvings on the walls, many of them well-executed. Among famous prisoners were Thomas More, Cranmer, Latimer, Penn, and Ridley; Anne Boleyn, Katharine Howard, Jane Grey; Walter Raleigh,



Sidney and Russell; and among royalty, David II. and James I. of Scotland, and Queen (then Princess) Elizabeth.

For details of architecture, reference must be made to the official pamphlet of the Anct. Monuments Dept. of the Ministry of Works, 1947, or to a standard work such as Lord Gower's *The Tower of London* (1902), or Sir J. Younghusband's *A Short History of the Tower of London* (1926).

**Tower Mills**, see under WINDMILLS.

**Town Council**, in England the governing body of a mun. bor. or co. bor. (see BOROUGH). Where the particular tn. is included in the co. area the co. council has overriding administrative powers in certain matters; but in the case of co. bors. the T. C. is practically independent of all other local governing authorities (see LOCAL GOVERNMENT). The T. C. consists of the mayor (*q.v.*), aldermen and councillors. The qualifications for membership are either the ownership of freehold or leasehold property within the area of the authority or registration as a local gov. elector for the area or residence within the area during twelve months preceding the election. In addition qualified persons must be Brit. subjects, and at least twenty-one years of age. There are certain disqualifications contained in the Local Gov. Act, 1933. The term of office is three years, one-third of the whole number of councillors of the bor., or of each ward thereof where the bor. is divided into wards (being those with the longest term of membership without re-election) retire in May every year and are eligible for re-election. Persons entitled to vote at an election of councillors are those who appear as local gov. electors on the register of electors for the area. The number of aldermen is one-third the number of councillors and they are elected by the councillors from the members of the council or persons qualified to be councillors of the bor. The ordinary election of aldermen is held in every third year at the ann. meeting of the council in May, and takes place immediately after the election of the mayor. The mayor is elected annually by the council as the first business of the ann. meeting from persons who are, or who are qualified to be, members of the council. He is the civic head of the bor. and presides over the T. C. The provisions of the Local Government Act, 1933, govern the constitution and meetings of T. Cs. A T. C. must hold an ann. meeting and at least three other meetings yearly which are to be as near as may be at regular intervals. Business cannot be transacted at meetings unless at least one-third of the whole number of members are present. Acts of the Council and all questions coming before the council are decided by a majority of such members as are present and vote. Thus, if there are thirty-six members of the council and twelve only are present, nine of them could pass an effective resolution. Bor. councils usually meet monthly. The council can make standing orders for the regulation of their proceedings which may supplement statutory rules but not be at

variance with them. Except in the case of business required by law to be transacted at the ann. meeting no business can be transacted at a meeting of the council other than that specified in the summons relating thereto.

**Town and Country Planning**. What is now known as tn. and country planning is not new. An examination of anct. tns., and cities shows that they were constructed to a plan designed to give protection to the inhab. against attack. There was a central area used as a meeting or mkt. place. The siting of tns. and cities indicated that planning considerations had been borne in mind, i.e. communications and water supply, and, as a result, they were usually sited near to ports or rivers. The Romans developed communications by road to a high degree, and their tns. and cities were sited strategically for purposes of control and defence. With the growth of pop. in many tns., the growth of cities ceased to proceed according to any plan. There were, however, some exceptions, where a ruler took an interest in beautifying his cap. or wished to facilitate his domination of it, or where, as in the eighteenth and nineteenth centuries in Britain, large estates were laid out by landowners for speculative building purposes, as in the W. end of London and Bloomsbury, in Bath and Edinburgh, and in seaside tns. such as Hove and Eastbourne.

The enclosures of land and the Industrial Revolution encouraged an exodus from the country into the tns., and in the absence of planning and public health control small insanitary dwellings were erected in narrow streets near the factories. Public health legislation was soon enacted empowering local authorities to control the type and method of construction of houses, the width of streets, etc., but not the siting. Consequently, residential and industrial buildings could be erected side by side without thought as to amenity, traffic routes, etc. No thought was given to relation of agric. urb. life. The problems thus created and the lessons taught were left to the twentieth century to solve.

**Aims of Planning**.—The basic aim is the promotion of human welfare, health, safety, amenity, and convenience. To ensure healthy living conditions a community must have satisfactory systems of water supply, drainage, and sewage disposal, buildings planned with sufficient space about them to permit of access of light and air, and areas for recreation. Safety requirements are concerned not only with the type of construction but with the provision of access to buildings so designed as to avoid congestion and danger from traffic and from fire. Amenity necessitates the siting and design of buildings and the preservation of natural features to create a harmonious whole. Convenience requires attention to communications, the grouping or zoning of buildings so as to enable the community to function economically and efficiently, and preservation of balance between the distribution of industries and pop., and the conservation of agric. land.

**Early Planning Legislation.**—The first general Act of Parliament dealing specifically with planning was the Housing, Town Planning, etc., Act, 1909; the planning provisions (which constituted Part II. of the Act) enabled local authorities to prepare town planning schemes in relation to land in course of development or likely to be so used. The object was to 'ensure by means of schemes prepared by local authorities or landowners that land in the vicinity of tns. should be so developed as to secure proper sanitary conditions, amenity and convenience in connection with the laying out of the land itself.' The Public Health Acts, byelaws, and regulations relating to sanitary matters, etc., had regulated the development of individual plots in the interests of public health, but had done little to ensure amenity and convenience, and, therefore, the first planning Act represented a significant advance in the control of development in the interests of the community.

Under the 1909 Act a scheme could only refer to land in course of, or likely to be developed; the prior consent of the Local Gov. Board (now the Ministry of Health) had to be obtained to the preparation of the scheme and subsequently the scheme had to be approved by the Board after having been laid before Parliament. The system was cumbersome, and it was timidly administered, and after the First World War the Housing, Town Planning, etc., Act, 1919, removed the necessity of obtaining consent to prepare a scheme and of laying it before Parliament. The Act also introduced the method of interim development control whereby development between the passing of a resolution to prepare a scheme and the actual preparation of the scheme was subject to such conditions as would ensure that the development would not conflict with the contents of the scheme, or if the conditions were not complied with, then the non-conforming development could, when the scheme came into operation, be made to comply with the provisions of the scheme without payment of compensation by the local authority; alternatively, development carried out in accordance with the conditions would attract compensation if subsequently it had to be altered to comply with the provisions of the scheme. Furthermore, the Act rendered it obligatory for local authorities with a pop. of 20,000 and over to prepare and submit planning schemes within a specified period.

In 1925, planning was separated from housing legislation and consolidated in the Town Planning Act, 1925. Co. councils had no active part in the preparation of schemes but the Local Gov. Act, 1929, which considerably increased the powers of co. councils as highway authorities, also empowered them to prepare schemes in default of co. dist. councils, to join with other local authorities in preparing schemes and by agreement to take over the planning powers of co. dist. councils.

The Town and Country Planning Act,

1932, repeated the previous planning provisions and re-enacted the law in a consolidated form with certain important changes, the most important being 'the extension of planning to any land whether there are or are not buildings thereon.' The planning authorities remained the same, i.e. co. bor. and co. dist. councils, who could, however, act together by means of a joint committee. It was necessary for the local authority to pass a resolution to prepare a scheme; the resolution had to be approved by the minister of health, and when approved it brought into operation interim development control. The Act was defective in that it left the initiative for carrying out schemes with the owners of the land, and local authorities were frightened by the compensation provisions which enabled a landowner to claim compensation for injurious affection where he claimed to have suffered damage from the restrictions imposed by a scheme which had come into operation. Consequently, the preparation of schemes proceeded slowly. The Restriction of Ribbon Development Act, 1935, was passed with the object of arresting development in ribbon formation along the edges of arterial and trunk roads. (See **REBBIEN DEVELOPMENT**).

**Commissions of Enquiry into Town and Country Planning.**—The Report of the Barlow Commission (Cmd. 6153) was issued in 1940. The Commission inquired into the causes and probable future trend of the drift of industries and workers to the larger tns. and the social, economic, and strategic disadvantages arising therefrom, and recommended action to re-develop congested urb. areas by decentralisation of pop. and dispersal of industries from them to garden cities, satellite tns. and existing small tns. The Commission were concerned that a check should be made on the concentration of pop. in the S. Midlands, the S.E., particularly London, and that the industrial areas in the N. and S. Wales should be revived.

The Scott Commission was appointed in 1941 to consider the conditions which should govern buildings and other constructional development in country areas consistently with the maintenance of agric. and in particular the factors affecting the location of industry, etc. While recognising that the location of many heavy industries was determined by immutable physical conditions and that other industries though theoretically 'mobile' were in practice tied to a limited choice of locality, the Commission recommended (July 1942) that where the latter were brought into rural areas they should be located in existing or new small tns. rather than in vills, or open country and that wherever possible new tns., housing estates, garden cities, and suburbs should be sited away from the better agric. land.

The Uthwatt Committee was appointed to consider and report upon compensation and betterment arising in connection with land development. Its first interim report (Cmd. 6291, 1941) advocated the setting up of a central planning authority

to lay down a national policy for agriculture, industrial development and transport, and the fixing of compensation for the public acquisition of land at pre-war values, i.e. value as at 31st March 1939. The final report (Cmd. 6381, 1942) confirmed the earlier recommendations and put forward an elaborate scheme for dealing with compensation and betterment in connection with planning control, a distinction being made between developed and undeveloped land.

*Subsequent Legislation on Town and Country Planning.*—In 1944, the gov. pledged itself to secure a balanced industrial development in areas which had in the past been unduly vulnerable to unemployment. These areas have subsequently become known as 'development areas'. Shortly after a White Paper was issued on the Control of Land Use based largely on the recommendations of the Uthwatt Committee but not making any differentiation between developed and undeveloped land and proposing that all land be subject to a 'betterment' charge where the value was increased by planning operations.

The Minister of T. and C. P. Act, 1943, provided for the appointment of a minister of T. and C. P. to take over the planning functions of the Ministry of Health, and also for the estab. of statutory commissions for the purpose of exercising such functions in relation to the use and development of land in England and Wales as might be subsequently decided, e.g. the National Parks Commission. The T. and C. P. (Interim Development) Act, 1943, extended interim development control to those areas where the responsible authority had not passed a resolution under the 1932 Act to prepare a scheme. The Act also enabled interim development authorities to take positive action for the purpose of making developers apply for permission to develop or change the use of the land and to bring development contravening a conditional permission into conformity with that permission. Also, the minister could take over, by direction, development applications for decision by himself in the light of national policy. The T. and C. P. Act, 1944, gave positive powers for the re-planning and rebuilding of areas of 'extensive war damage' and of 'bad lay-out and obsolete development.' The New Towns Act, 1946 provided for the making of Orders by the minister for the construction of new towns on sites selected by the minister and the appointment of Development Corporations to be responsible for the lay-out and construction of such new towns.

Prior to 1947 the planning system contained a number of defects. In the main it was based on the 1932 Act, which required the preparation of a scheme, which when prepared had the effect of law and was comparatively static, as it could only be altered by a long and cumbersome procedure. Planning was in the hands of urb. and rural dists., boroughs, and co. bors., which tended to plan their areas in isolation from their neighbours.

There was no time limit within which a scheme had to be prepared and because of the difficult compensation and betterment provisions of the Act many local authorities preferred to continue under interim development control. The system was negative, only controlling development proposed to be carried out and not itself bringing about development. It was hoped that these defects should be removed by the T. and C. P. Act, 1947.

Thus Act entirely changed the position of town planning and contained revolutionary provisions. Co. councils and co. bor. councils were made the planning authorities, though the detailed working of the plans might be delegated to dist. councils. The planning scheme was replaced by a development plan which had to be prepared within three years and thereafter reviewed at five-yearly intervals. The idea was that preparation of the plan would be preceded by a survey and an attempt made to secure a proper balance between competing demands for land so that all land should be used to the best advantage in the interests of the community as a whole.

The plan requires the approval of the minister of T. and C. P. and landowners, and others are given an opportunity of inspecting the plan and making representations thereon, both to the local planning authority and to the minister. Planning permission will be required for all development (which includes change of use of land as well as the construction or alteration of buildings, roads, etc.) other than the limited and small exceptions contained in the Act and the regulations made thereunder. The Act enables local authorities to buy land compulsorily, even for leasing to a private person for development in accordance with the plan. Thus plans need no longer be rendered abortive because an owner of land required for a purpose in accordance with the plan refuses to sell. Land likely to be required within ten years for development by gov. depts., local authorities, and others can be designated on the plan as 'subject to compulsory purchase.' The Act also contains provisions for the control of advertisements, the preservation of buildings of special architectural or historic interest, and of trees and woodlands. Interim development control is provided for by the T. and C. P. (General Development) Order, 1948.

The most revolutionary provisions of the Act are those relating to the imposition of a development charge assessed on the difference between the value of the land for its existing use and its value for some other use for which planning permission is given. Thus all increases in the value of land arising out of building or the change of use of existing buildings development are vested in the State. These provisions have already caused protest (1950) and sev. authorities have suggested that they are unnecessarily stringent. The Act does not recognise any right to compensation on the part of landowners for the loss of development value but to cover cases of hardship &

sum of £300,000,000 was provided and landowners were given an opportunity up to July 1, 1949 of claiming on this sum.

An obligation is placed upon developers to pay or to give security for the payment of the development charge assessed by the Central Land Board before any development or change of use is carried out. Broadly speaking, the effect of the development charge system will be that land bought for development will change hands at its existing value and the purchaser will have to take into account the charge he will have to pay to the Board in respect of the development proposed.

The Act aims at reducing the cost to local authorities of good planning by extinguishing development values as these have been taken out of private hands and therefore the planning authority will not have to pay heavy compensation. Certain exemptions from development charges are conferred on gov. depts., local authorities, charities, and areas developed as a whole by Development Corporations under the New Towns Act, 1946. Local authorities and Development Corporations will make payments in lieu of development charges of such amount as may be determined by the minister. The 1947 Act substitutes a revised grants scheme for that contained in the 1944 Act and includes in the scheme areas of bad lay-out, obsolete development and derelict land which require to be developed as a whole.

The enforcement of planning control is strengthened by enabling the planning authorities to secure the restoration of land to its former condition or compliance with conditions where development is carried out without permission or not subject to the conditions attached to the planning consent. Also, on payment of compensation, the planning authority can order the discontinuance of any existing building, if it is necessary on planning grounds. Where planning permission is refused or unacceptable conditions are imposed, the intending developer has a right to appeal to the minister. If as a result of refusal or the imposition of conditions, the land is incapable of reasonably beneficial use, an owner may require the local authority (co. dist. or co. bor council) to buy the land.

The Board of Trade exercises control over the location of industry, as the Act provides that an application for permission to develop will be of no effect in the case of an industrial building of an aggregate floor space exceeding 5000 sq. ft. unless accompanied by a certificate from the Board that the development in question can be carried out consistently with the proper distribution of industry.

**Planning Associations, etc.**—The Town and Country Planning Association is an association of individuals and bodies interested in the subject. The National Housing and Town Planning Council is an association of local authorities. The Univs. and the Architectural, Surveyors' and Engineers' professions lay great emphasis on a study of planning law and

methods and have specialised courses both in England, Scandinavia, and the U.S.A.

**Town Planning in the U.S.A. and Europe.**—The serious study and application of the principles of tn. and country planning have been practised in the U.S.A. since the nineteenth century. Examples of conscious planning can be seen in some of the lay-outs of the original colonial tns., especially in the S., and later planning examples are the geometric centres of New York, Chicago, etc. In recent years, the 'zoning' principle has been carried out in many new tns. Most new tns. in the U.S.A. are now planned on this principle. The idea of decentralisation by means of satellite tns. (q.v.), though widely supported in theory in the U.S.A., has not been consciously applied, as in Britain, on any large scale. In Europe, tn. planning has been practised especially in Sweden, Denmark, Italy, and Germany (under the Fascist régimes in the last two countries). In Germany, the building of satellite tns. was sponsored by the gov. between 1933 and 1939 and an extensive road network developed in relation to them. In France, the rebuilding of Paris's centre under Napoleon III. is an example of nineteenth-century planning; but generally France's contribution to tn. planning theory has not been great.

See T. H. Hughes, and E. A. G. Lamborn, *Towns and Town Planning, Ancient and Modern*, 1923; C. M. Purdon, *Town Theory and Practice*, 1921, and *The Building of Satellite Towns*, 1925, 1949; L. P. Abercrombie, *Town and Country Planning*, 1933, 1943; B. Schwan, *Town Planning and Housing Throughout the World* (trans.), 1934; T. Sharp, *Town Planning*, 1940; G. Gibbon, *Reconstruction and Town and Country Planning*, 1942; J. H. Forshaw, *The Greater London Plan*, 1944; L. Mumford, *City Development*, 1946; C. Le Corbusier, *Concerning Town Planning*, 1947; and T. Hill, *Town and Country Planning Act, 1947*, 1948.

**Towneley Plays, The, or Wakefield Mysteries**, are thirty-two in number, and are believed to have been compiled by the friars of Wicliffe or Nostel in the fourteenth and rearranged in the fifteenth century. Like the York plays, etc., the various 'pageants' together dealt with the whole Bible story. The simple religious sentiment is by no means marred by the comic element, which never endangers the dignity of the whole. The cycle was ed. for the Surtees Society in 1836, and by G. England, and A. W. Pollard in 1897 for the Early Eng. Text Society. See E. F. Williams, *The Comic Element in the Wakefield Mysteries*, 1914; and M. Carey, *The Wakefield Group in the Towneley Cycle*, 1929.

**Townsend, Meredith White (1831-1911)**. Eng. newspaper proprietor and man of letters, b. in London and educated at Queen Elizabeth's Grammar School Ipswich. At sixteen he became an usher in a small Scottish school but later went to Serampore, India, as asst. editor of *The Friend of India* of which in 1852 he

became editor and in 1853 proprietor. In 1859 he finally returned from India on account of health, and in 1861 he bought *The Spectator* (q.v.), which he edited in conjunction with R. H. Hutton (q.v.) until the latter's death in 1897. Their joint editorship is historical in journalism, and a later editor, J. St. Lee Strachey, said of T. that 'he was, in the matter of style, the greatest leader-writer who has ever appeared in the English Press.'

**Townsend, Mrs. Stephen**, see BURNETT, FRANCES ELIZA HODGSON.

**Townshend, Charles**, second Viscount (1674-1738), Eng. statesman, b. at Raynham Hall, Norfolk, played a part in supporting the Hanoverian succession. He was one of the commissioners for the Union with Scotland, was joint plenipotentiary with Marlborough at the Hague, and negotiated with Holland the Barrier Treaty. Dismissed in 1712 on the formation of the Harley ministry, he kept up a correspondence with the court of Hanover, secured the confidence of George I., and on the latter's accession was appointed secretary of state of the N. Department. He lost favour with the king in 1716, and was sent to Ireland in 1717, but was soon dismissed. In 1720 he was President of the Council under Stanhope, and on Stanhope's death (1721) became again secretary of state, which office he held until 1730, and then retired into private life. He encouraged turnip growing and greatly improved the rotation of crops, being known as 'Turnip Townshend.'

**Townshend, Sir Charles Vere Ferrers** (1861-1924), Brit. soldier, b. at Raynham, Norfolk; entered the Marines in 1881. As



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GENERAL TOWNSHEND

captain in the Indian army he led the march to Chitral, Jan. 1895, he commanded there during siege, and was made C.B. He saw service in Egypt and Africa. In April 1915, T. was appointed to command the 6th Div. in Mesopotamia. He proceeded from Basra over flooded

country, with barges, reaching Amara, June 1. He captured Kut in Sept. Fighting Nured-Din at Ctesiphon, Nov. 22, he had to fall back on Kut, was besieged there, and surrendered April 29, 1916. In 1920 he pub. *My Campaign in Mesopotamia*. He was Independent M.P. for Wrekin, 1920-22. See also KUT AL AMARA.

**Township**, or Vill, originally probably a group of allodial proprietors united by community of agric. interests, the chief officer of which was the tithreeve. The T. is almost certainly one of the antecedents of the medieval bor. The term is not now in common use, but until recently meant legally a tn. containing more than one parishioner.

**Townsville**, port of Queensland, Australia, is situated on the E. coast. It is the seat of an Anglican bishop. The chief exports are sugar, meat, cattle, coal, silver-lead, and zinc concentrate. Pop. 35,000.

**Towton**, par. in the W. Riding of Yorkshire, England, midway between Leeds and York. The scene of the Yorkist victory of 1461. Pop. 80.

**Towy**, riv. of Wales, rising in the hills between Cardiganshire and Radnorshire. It flows on a southerly course, passing by Llandovery and Carmarthen, and enters Cardigan Bay at Llanstephan. Length 66 m.

**Townyn**, urban dist. and seaside resort of Merionethshire, Wales, situated on Cardigan Bay, 12 m. N. of Aberystwyth and 232 m. from London by the Western Region of British Railways. Its church of St. Cadvan is the largest and most interesting example of Norman architecture (1150-1200) in Merionethshire. Within it is preserved an inscribed stone dated by experts as c. 660 and accordingly considered to be probably the most ant. monument of the Welsh language. Pop. 3600.

**Toxæmia**, blood poisoning from the presence of toxins (poisons) in the blood (see PYÆMIA).

**Toxicology**, -science dealing with poisons. Its main branches deal with the chemical nature of poisons, their origin and preparation, their physiological action and the test by means of which their presence may be detected; the pathological changes due to their presence and the recognition of them by post-mortem evidences; their chemical reactions with a view to the determination of antidote and the physiological action of the latter. Poisons may act on various organs and systems of the body. Acids and alkalis are corrosive to the alimentary tract; carbon monoxide reduces the oxygen capacity of the blood by combining with hæmoglobin; digitalis affects the heart; strychnine the medulla and spinal cord. A tolerance is acquired to some substances such as opium, which can ultimately be taken in doses which would initially prove fatal. Certain poisons, such as salts of heavy metals, may accumulate slowly in the body and finally prove toxic in their action. Toxins are produced by pathogenic bacteria, and injections of such toxins, or of toxoids

prepared from them, are used in the production of immunity, e.g. to diphtheria. The number of poisons is very large; almost any substance may be dangerous if taken in sufficiently large amounts. See Sir S. Smith and F. S. Fiddles, *Forensic Medicine* (9th ed.), 1949; A. S. Taylor, *Principles and Practice of Medical Jurisprudence* (10th ed.), 1948. See also POISONS.

**Toxophily**, see ARCHERY.

**Toy-dogs**, diminutive breeds usually developed purely as pets. See GRUFFON BRUXELLOIS, KING CHARLES SPANIEL, MALTESE DOG; PAPILLON; PUG-DOG and YORKSHIRE TERRIER; see also under BLACK-AND-TAN TERRIER; and POMERANIAN.

**Toynbee, Arnold** (1852-83), Eng. economist and social reformer, b. in London. He was intended first for the army and then for the Bar, but ill health and literary activity prevented the following of either of these professions. He went to Oxford and finally gave himself up to the study of social and economic questions. He also did much practical work for the betterment of industrial conditions. In 1875 he went to Whitechapel, where he joined in work with Canon Barnett. T. wrote various articles which were pub. posthumously as *Industrial Revolution in England* (5th ed. with memoir by B. Jowett, 1906). See lives by F. C. Montague, 1889; and Viscount Milner, 1901; and L. L. Price, *Political Economy in England*, 1891, for a criticism of Toynbee as an economist.

**Toynbee, Arnold** (b. 1889), Brit. historian, b. in London, nephew of Arnold and Paget T. (q.v.). Educated at Winchester and Balliol College, Oxford, of which he became Fellow and tutor (1912-15). After attending the Peace Conference in Paris (1918) and serving for a short time as prof. of Byzantine and Modern Gk. at London Univ., he became in 1925 director of studies at the then newly-founded Institute of International Affairs (Chatham House). It is with this institution that his name is chiefly associated (see ROYAL INSTITUTE OF INTERNATIONAL AFFAIRS). There he has written contemporary hist. in the ann. *Survey of International Affairs* and *A Study of History* (1934-39), the latter a standard work on the evolution of civilisations revealing great erudition in the treatment of ant. and modern historical problems. In 1914 at the outbreak of the First World War he served in the Foreign Office and later as a member of the Brit. Delegation at the Paris peace conference. In the Second World War he again entered the Foreign Office, as director of a group of Chatham House and other scholars which developed into the Foreign Office Research Dept. In 1916 he was again a member of a Brit. delegation to a Paris peace conference. Other works by T. are *Western Question in Greece and Italy* (1922); *Greek Historical Thought* (1924); *Greek Civilisation and Character* (1924); *The World After the Peace Conference* (1925); *A Journey to China* (1931); *Christianity and Civilisation* (1940); and *Civilisation on Trial* (1948).

**Toynbee, Joseph** (1815-66), Brit. pioneer otologist (ear specialist). He studied particularly the pathology of the ear and pub. in 1860 his medical classic, *Diseases of the Ear*. He was appointed in 1857 aural surgeon to St. Mary's Hospital, London, which was the first general hospital to establish a special dept. for the ear. T. died as a result of an experiment in which he inhaled chloroform and prussic acid to test its effect on tinnitus (noises) of the ear. 'Toynbee Hall' (Whitechapel), the first Univ. Settlement, was named after his son, Arnold Toynbee.

**Toynbee, Paget** (1855-1932), Eng. philologist, b. at Wimbledon, educated at Haileybury and Balliol College, Oxford. He was a leading authority on Dante, having ed. *inter alia* critical texts of the *Divina Commedia* (1900) and of Dante's *Letters* (1912-17); also written *Life of Dante* (1900). He ed. books in connection with Horace Walpole (*Horace Walpole's Reminiscences*, 1924, etc.).

**Toynbee Hall, Whitechapel**, the first Univ. Settlement, founded by Canon Barnett, rector of St. Jude's, Whitechapel, and named after his friend and colleague Arnold Toynbee (q.v.). See under SOCIAL SETTLEMENTS.

**Toys**, implying, in a general sense, children's playthings. T. can be traced back to very remote periods. The top is mentioned in Virgil in the seventh book of the *Aeneid*, and was probably introduced into England by the Romans. The Gks. appear to have played with different kinds of ball: the little ball, the great ball, and the empty ball, which was blown out like the modern football. There is a fine collection of early Rom. dolls in the Musée du Louvre, Paris, of which a description is given in H. R. d'Allenmagne's *Histoire de Jouets* (1903); and deals very fully with dolls of different periods.

**Trabzon, Trebie, or Trapezus**, formerly **Trebizond**. (1) Prov. of Asiatic Turkey, on the S. coast of the Black Sea, heavily timbered and generally mountainous. Wheat and barley are grown and valuable timber produced. There are copper and zinc deposits. Area 16,671 sq. m. Pop. 396,700. (2) Cap. of the above, a port on the Black Sea, 108 m. N.W. of Erzerum, formerly of great importance as an emporium for the wares of Kurdistan and Persia, but has lost much of its transit trade since the Batum-Tiflis Railway was opened. The chief exports are hides, skins, eggs, opium, tobacco, and albert nuts. Its silk industry is declining. T. was founded in 600 B.C. by Gk. settlers from Sinope. In 1204 it was the cap. of Trebizond, an empire constituted by Alexius Comnenus. It became Turkish in 1482. In 1895 it was the scene of the Armenian atrocities. It was captured by the Russians in 1916, but in 1918 was retaken by the Turks. Pop. 50,000.

**Tracery**, in old architecture the ornamental stone framework over a Gothic window formed or traced by the mullions being continued, but diverging into circles, curves, and flowing lines embellished with foliations. The styles of T.

differed in different periods and countries, and were known as geometrical, flamboyant, flowing, etc. Geometrical T. assumed symmetrical forms such as trefoils, cinquefoils and circles, but later the designs became freer or flowing, while still later, in the fourteenth century, flowing T. was superseded by the more vertical bars of the Perpendicular period. With the Renaissance, T. disappeared.

**Trachea**, or **Windpipe**, air tube which leads from the larynx to the bronchi. It is about  $4\frac{1}{2}$  in. long, and is made up of fibro-elastic membrane enclosing cartilaginous rings about  $\frac{1}{2}$  in. in diameter. The interior consists of coatings of submucous tissue and ciliated epithelium. The T. begins at the larynx and proceeds downwards in front of the oesophagus until it bifurcates into the two bronchi. The T. is sometimes the seat of inflammation through the impaction of foreign bodies. In such cases the removal of the body is attended with a certain risk, but as the danger of respiratory obstruction is usually greater if the condition be allowed to persist, removal should be attempted with every preparation for the operation of tracheotomy.

**Tracheotomy** consists of cutting into the windpipe above or below the isthmus of the thyroid gland. A curved tube is inserted into the orifice, and by this means breathing is carried on. The operation is called for when the upper respiratory passages are obstructed by foreign bodies or morbid growths, as in diphtheria.

**Trachoma**, form of conjunctivitis in which small granular nodules form under the conjunctiva (q.v.). It is very infectious and very chronic, and the peasant races of middle and E. Europe are heavily affected with it. So much is this the case that emigrants seeking to enter the U.S.A. are excluded if they show signs of infection. The results of T. are often very serious: the sight may be seriously damaged, by injury to the cornea, and the eyelids may become deformed. Malnutrition is an important factor in T.

**Trachonitis**, dist. of anct. Palestine, corresponding to the modern Latakia. It lies S. of Damascus, E. of Aulantis and N. of Batanea, in Bashan. In A.D. 37 Herod I., king of Judea, received the tetrarchy of Batanea and T. from Caligula.

**Trachyte**, volcanic type of the sub-acid igneous rocks. Characteristic minerals are orthoclase and hornblende, the felspar occurring usually as sanidine (with Carlsbad twinning). The T. are named after their most conspicuous mineral, thus: sanidine T., hornblende T., etc. The leucitophyres and phonolites are trachytic rocks containing leucite and nepheline respectively. Trachytic rocks are found chiefly on the Continent, in Auvergne, Hungary, and Bohemia and in the vicinity of Rome. They are much less common in Britain, occurring in E. Lothian, Skye, and Cornwall. In America they are not much represented, but they occur in S. Dakota.

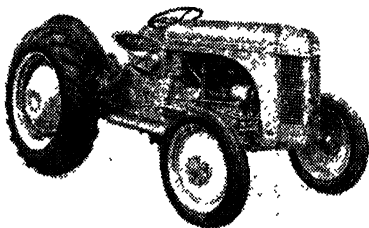
**Track and Field Sports**, term applied in the U.S.A. to athletic contests, including flat and hurdle racing on cinder track and

field events—long and high jumps, pole vault, throwing the discus, putting the weight, and throwing the javelin. The Inter-collegiate Association of Amateur Athletics, to which most Amer. colleges belong, arranges contests annually. Apart from the colleges, the largest body is the Amer. Amateur Athletic Association, but there are many other smaller ones. It is largely due to the keenness engendered by these organisations that Amer. athletes hold their present place in the world's records and in the Olympic Games. See **ATHLETICS**.

**Trackways**, term applied generally to prehistoric routes and particularly to pre-Rom. ways in England. Their prin. purpose was the conveyance of goods, and they ran roughly in a straight line, being sited by such natural objects as stones, tumps, and ponds. It is probable that some of the Rom. roads (e.g. Watling Street) followed at least in part these T.s.

**Tractarianism**, see **OXFORD MOVEMENT**.

**Tractor**, name given to a compact mobile power-unit, used primarily for agric. purposes and generally deriving its energy from a petrol, fuel-oil, or vapourising-oil engine, though steam-engined tractors have been used extensively in the past and are occasionally used to-day for heavier haulage and stationary belt-work. Certain countries, including Russia, are re-experimenting with the use of electricity as the motive power. In the early 1880's Brit. engineers had designed and built heavy



Harry Ferguson, Ltd., Coventry

The tractor has a 4-cylinder wet-sleeve petrol engine with maximum belt horse-power of 23.9. There is a power take-off shaft for belt and pulley work at the rear, and a hydraulic system of depth control for regulating the working depth of any rear-mounted implement.

steam traction-engines for farming work, but it was the Amers. who first conceived the then novel idea of powering the farm tractor by means of the internal combustion engine. In 1889, the Amer. Burger T. made its appearance in the Middle W. A massive and somewhat unwieldy machine of cumbersome proportions, its chassis was built to steam-engine specifications yet it was powered by a single cylinder Charter internal combustion engine. Though exposing the limitations

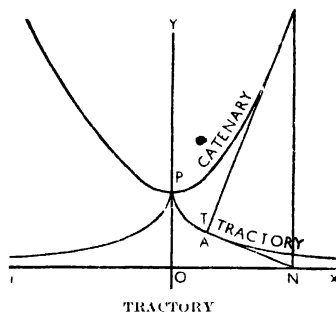
of its designers, the idea caught on and from then onwards the general use of steam Ts. gradually diminished. The influence of the steam-type chassis, however, was such that it was not until 1899 that a specific friction-driven chassis with a hopper-cooled petrol engine was manufactured in America. This was possibly the first real attempt to break away from the heavy steam engined type of chassis construction so favoured by the earlier engineers. The development of the many types of farming Ts. appearing during the period 1899-1914 was largely in the hands of the Amers., though it is only fair to add that by now many reasonably reliable Brit. machines were being manufactured. Designers were now turning their attention to the problem of affording some sort of weather-protection both to the operator himself and the various vital parts of the power-unit; the Amers. were the pioneers in a matter which had remained neglected for too long.

But it was the food crisis of 1916 which gave the real impetus to tractor design and production both in Britain and the U.S.A. The Brit. Gov. instructed its ministry of munitions to develop a utility T. and this, known as the 'M.O.M.', is generally reckoned as the forerunner of the lightweight internal combustion engined T. as we know it to-day. Since 1918 much progress has been made in T. design. Crawler types (track-layers) were developed to work under those heavy soil conditions in which a wheeled T. would be reduced to immobility. 'Wheelbarrow' Ts., suitable for the market gardener and horticulturist, have also been manufactured. Certain types of Ts. have been manufactured with regard to the farmer's requirements in the matter of row-crop work with its many variations of widths and adjustments. The T. is now no longer a mere haulage machine; in the main it is a highly specialised item of modern farming machinery. Another major development is the integration of the T. and implement as one co-ordinated unit, an idea originated and developed by an Ulsterman, Mr Harry Ferguson. The principle of the system is that the implement is no longer towed by the T. but is an integral part of it, being mounted directly on to the rear of the machine and hydraulically controlled by the tractor driver himself from his seat. The obvious advantages of the system (now widely used all over the world), lies in the more positive and accurate control over the implement concerned plus greater traction and the consequent reduction in labour costs since one operator only is needed.

With reference to the engines used to-day it may be said that whereas power-units were formerly of the heavy and slow-revolutionary type, the present trend is towards high-efficiency light weight to power-ratio engines developing high brake horse power and of sturdy endurance. Engines fuelled by vaporising-oil are enjoying great popularity in Britain and indeed throughout the world, while the fuel-oil compression-ignition type and the petrol engine are also used extensively.

Each type has its respective merits. To-day it is difficult to foresee the ultimate trend in T. design. On the farm there is little that the T. cannot do, not only in cultivation and haulage but also—by belt and pulley—it is able to drive such necessary accessories as the circular saw and the threshing machine, etc. But power farming is an established fact, and the driving force is the agric. T. See also PLOUGHS AND PLOUGHING. See H. J. Hines, *Tractors on the Farm*, 1942, and C. Culpin, *Farm Machinery*, 1946.

**Tractory**, or **Tractrix**, curve traced by a heavy particle dragged by an inelastic string attached to a point moving in a straight line. It is represented in the figure, where its evolute, the catenary, is also shown. Tangents intercepted between the curve and the x-axis are of equal length. If a point P be taken on the curve, its co-ordinates being  $x, y$ , then the arc  $AP = a \log a/y$ , area =  $a^2 \csc^{1/2} y/a$ . The curve is asymptotic to  $xx_1$ , and a circle with radius equal to the tangent has an area equal to the total area included in the four branches of the curve symmetrically disposed to the axis.



**Trade and Commerce.** Trade or commerce is the exchange of commodities for money or other commodities, the term 'commerce' tending to be confined to large-scale exchange. The word 'trade' is related to 'tread'—a reminder that the beginnings of trade were associated with travel and the trodden way. The 'commerce' derives from 'merchandise' and involves the idea of bargaining. Throughout hist. wars have had a profound effect on trade. Early trading expeditions often combined trade and plunder, sea-traders mixing commerce and piracy. Land commerce followed the caravan routes of the anct. world, the Nile and the Euphrates being connected by the route leaving Egypt to pass along the coast of Palestine and by the mts. of Lebanon before turning E. to the basin of the Euphrates and Tigris, cradle of Babylonian and still older civilisations. Between Lebanon and the sea was the narrow land of the Phœnicians, a sea-faring people whose ships traded Mediterranean and Black Sea products as well as the tin of Cornwall and the precious caravan freight



of the E. Before the Phœnicians there was an active commerce across the E. Mediterranean between highly-civilised Cnossus (Crete) and Egypt. The Gks., sailing from is. to is. in the Ægean became great sailors in their turn, extending their colonies to Marseilles and beyond; rivalling and eventually surpassing their Phœnician tutors. The conquests of Alexander the Great, by bringing E. and W. into contact, gave an immense stimulus to commerce. Alexandria became a great city, a centre of manuf. and of trade with the Far E. through the Red Sea. The Gks. came into collision with the great Phœnician colony of Carthage, founded 800 B.C., which dominated the Mediterranean and its commerce; but it was a new power, Rome, that destroyed it (146 B.C.). The Romans were not a commercial people but their Empire, with its superb network of roads, its posts, and above all, its Pax Romana, provided a unique basis for settled trade.

The eventual fall of Rome (A.D. 476) thrust the provs. of the W. Empire back towards barbarism. Roads fell into disrepair. On the ruins of Roman civilisation trade collapsed. Based on manor and vil., life became localised and primitive. Before trade revived in Europe the rise of Mohammed in the seventh century had carried commerce as well as the sword from Bagdad through N. Africa to Spain; making Damascus, Cairo, Kairouan, Fez, Granada, Cordova, Seville, and Toledo, prosperous centres of industry and commerce. European revival came after A.D. 1000. Tns., new and old, were growing, and with fair and market continued to grow in spite of handicaps—bad roads, too little money and too many mints, multiplicity of regulations, tolls, duties, prohibitions, etc. Within the tns. trade came under the protection and restriction of the merchant and craft guilds (*see* TRADE UNIONS) and did not escape the regulation of the Church which forbade usury and frowned on profit. As the tns. developed and prospered they gained power which vied with that of lord and bishop. Tns. with common interests formed leagues. The Rhenish League in the thirteenth century soon embraced over ninety cities (Cologne, Strasburg, Frankfurt, etc.), with hundreds of vessels on the Rhine. It destroyed castles and swept away tolls. The Swabian League (Augsburg, Nuremberg, Ratisbon, etc.) was based on the Danube and traded N. products with those of the E. through Venice and other cities. In N. Germany and the Baltic the powerful Hanseatic League (*q.v.*) grew rapidly from the thirteenth century, with depots at Bruges, Bergen, Novgorod and London (Steelyard). The League dominated the Baltic as did Venice the Adriatic; their ships meeting at Bruges exchanged the produce of N. and S. Venice and the League both had their part in the Crusades (1096–1272) which had a greater influence than the campaigns of Alexander in promoting commerce between E. and W. Venice was the gateway to trade with the Levant and the E.; along with Genoa and

Florence she enjoyed immense wealth and power until c. 1500, the discoveries of the Americas and the Cape route to India, altered the pattern of world trade. The Mediterranean ports declined in importance and trade went to Antwerp, London, and other ports well-placed for ocean commerce with the new and old worlds. The discoveries of new lands were matched in the realm of ideas by the Renaissance and the Reformation, reinforced by the new art of printing. These influences, with the advance of commerce, the invention of gunpowder and the standing army, which all favoured national power against tn. and league, were ending feudalism and the Middle Ages. The pope divided the non-Christian world between Spain and Portugal. The Sp. galleons, bringing the precious metals from the New World, helped both to stimulate European trade and to raise prices. Under the new Mercantilist policy pursued by the nation-states it was the general aim to secure an excess of exports over imports—a favourable balance of trade which would command gold or silver for currency or 'war chest' purposes. Portuguese ships monopolised trade with the E. Indies until they lost power and trade to the Dutch in the seventeenth century. The same century saw the wane of the Sp. power following wars with the Dutch and the growing power of England. In the second half of the century the Eng. were fighting the Dutch for maritime and commercial supremacy and by 1713, the treaty of Utrecht, following Marlborough's victories over the French, estab. the ascendancy of England, with France as her only rival. The treaty gave England the slave trade monopoly with the Sp. colonies. Colonial trade was conducted frankly in the interest of the mother country, and in the eighteenth century successes against the Fr. in America and India further extended Brit. colonial power and trade. Nevertheless, increasing trade with the U.S. after their secession (1776–1783) demonstrated the mutually advantageous character of the trade between Britain and her late colonies. Eng. commercial predominance had grown from small beginnings in the Middle Ages when her great export was raw wool. The Eng. Merchants of the Staple exported raw materials via (*e.g.*) Calais; but up to the time of the Tudors the export trade was mainly in the hands of foreigners. The Hanseatic League privileges were annulled by Elizabeth. By the fourteenth century less wool began to be exported in its raw state and more in the form of cloth. In 1660 wool export was forbidden. Huguenot refugees enriched England and other countries at the expense of France. Thanks to them the Eng. silk industry assumed importance in the early eighteenth century. The woollen and silk industries were protected against the competition of Indian cotton goods, a protection serving to foster the cotton industry that became a pillar of Eng. commerce.

At the close of the Middle Ages the

growth of national power favoured the rise of national commercial companies, recognised by Royal Charter; and formed, many of them, as their names indicate, to exploit the world as opened up by the voyages of discovery. Eng. companies included, besides the early Merchant Adventurers (1404 and 1505), the Muscovy Company (1553), the Eastland Company (1579), the Guinea Company (1588), the Levant Company (1592), the E. India Company (1600), the Hudson's Bay Company (1670), the Royal African Company (1672), and the S. Sea Company (1711) of 'Bubble' fame. Other famous companies were the Dutch E. India Company (1602) and the Dutch W. India Company (1621). The former broke the Portuguese power in the E.—and for two centuries earned an ann. average of 18 per cent: the latter, a corporation of privateers making armed attacks on the Sp. 'silver fleets,' often earned from 25 per cent to 100 per cent a year. Company trading was intended to secure regulation and control but failure in this respect and changing conditions reduced their number, few surviving the eighteenth century. One of the last Eng. companies to go was the E. India Company whose activities in India extended to gov. as well as trade. New ideas were stirring in the later eighteenth century. In England Adam Smith was advocating Free Trade; while the Industrial Revolution gathered momentum as invention followed invention. Machinery was being applied with increasing ingenuity to textile and other industries. Steam was harnessed to drive the machine and pump the mine. Coal was smelting the iron and becoming the main source of industrial power. By the turn of the century steam and machinery were playing a great part in this country's industrial and commercial predominance. A graph of United Kingdom exports for ten-year periods from 1701 to 1930 (E. Staley, *World Economic Development*) shows a steep rise in volume from 1781-90 to 1851-60, despite the Napoleonic wars; a less steep rise to 1881-90; and a rise to the decennium before the First World War at a lesser rate again. The graph does not cover invisible exports, an increasingly important part of Britain's foreign trade since 1851-60. The railway and the steamer, with good roads and canals, had come to reinforce the Industrial Revolution before 1851-60; and from then on there was the trade flip of the gold discoveries; and above all, Free Trade. Britain had an export surplus but used it in no Mercantilist spirit, investing abroad some £4,000,000,000 net by 1913—to her own and the world's great benefit. Free Trade made England the free entrepôt for world trade; brought cheap food to her people and cheap raw materials to keep her exports competitive. More than that it brought a new spirit to mankind with hopes of universal peace. The Brit. lead made a great impression throughout the civilised world. Tariffs were lowered and in 1860 there was a reciprocal reduction and abolition of

tariffs with France. But in the end the great nations retained and reinforced their protective systems. The United Kingdom retained Free Trade up to the First World War but, after the Great Slump and the Second World War, had abandoned *laissez faire* not only for protection but for a planned economy. Planned economies are a world feature—planning is on a world scale and the subject of European and World conferences. In the shadow of two world wars and the threat of a third the achievement of general Free Trade seems remote. Increasing freedom in trade is, however, the great aim of the United Nations as of its most powerful member, the U.S.A., now outstandingly the world's greatest industrial and commercial nation. Predominant in manuf., the U.S. may be thought to have as little to fear from foreign competition as the United Kingdom a century earlier. The United Kingdom built her wealth on the exchange of manufactured goods for food and raw materials. The field for this essentially profitable trade is diminishing; but there will always be room for international trade on a large scale given a world of settled peace and freedom from unemployment—a world which dares to plan for maximum specialisation with rational hope of maximum reward.

World export values for 1919 are estimated as \$56,700,000,000, European countries exporting 22,700,000,000, and the U.S. and Canada 11,850,000,000; while volumes, compared with 1937, are 103 per cent, 87 per cent, and 189 per cent. These figures (United Nations, *Monthly Bulletin of Statistics*, May 1950) fail of course to reflect the internal commerce of e.g., the great Free Trade area of the U.S. It is in the smaller countries that trade bulks largest: Denmark, 68 per cent; New Zealand, 55 per cent; Norway, 52 per cent; Netherlands, 47 per cent; Sweden, 39 per cent; Canada, 37 per cent; Australia, 34 per cent; France, 30 per cent; United Kingdom, 24 per cent; Japan, 23 per cent; Germany, 14 per cent; U.S.A., 6 per cent. These are 1938 percentages (E. M. Patterson, *see below*) of foreign trade to national income. Estimated increases (Staley) in the average ann. vol. of international trade: 3.02 per cent (1881-1894); 3.84 per cent (1894-1907); 4.52 per cent (1907-1913); and 4.85 per cent (1925-1929).

See CUSTOMS DUTIES, ECONOMICS, FREE TRADE, IMPORTS AND EXPORTS, MERCANTILE SYSTEM, PROTECTION. See W. C. Webster, *A General History of Commerce*, 1903; C. Day, *A History of Commerce*, 1914; J. R. Smith, *Industry and Commerce*, 1926; G. W. Southgate, *English Economic History*, 1936; J. B. Condliffe, *The Reconstruction of World Trade*, 1941; A. J. Brown, *Industrialisation and Trade*, 1943; E. Staley, *World Economic Development*, 1945; and E. M. Patterson, *An Introduction to World Economics*, 1947.

Trade, Board of, gov. dept. of the United Kingdom, formally a committee of the Privy Council. From 1622 onwards various committees to advise the Privy

Council on trade matters were appointed and dissolved. Its present form dates from 1786 when a permanent committee was constituted by an Order in Council, which is still in force and provides the constitutional basis of the present Board. The members of the Board included the Archbishop of Canterbury, the First Lords of the Treasury and of the Admiralty, the prin. secretaries of state, the holders of a number of other Crown offices, and sev. private persons; but by the end of the Napoleonic wars the president and vice-president were the only operative members. From 1786 until the middle of the nineteenth century, the Board's functions were mainly those of advising the gov. and other depts. (particularly the Foreign Office on commercial policy and treaties, and the Treasury on customs and excise matters) and of collecting information about trade and industry. During the second half of the nineteenth century the Board was allotted administrative functions under Acts of Parliament, notably responsibilities relating to the railways, trainways, mercantile marine, harbours, and electricity. As a result of increased gov. activity in industrial and trade matters during the First World War, new ministries were created to perform the Board's previous functions in respect of labour, railways, tramways, harbours, and electricity. During the Second World War its responsibilities for food, shipping, the gas industry, petroleum, and the coal mines were also transferred to other depts. The Dept. of Overseas Trade, which had been set up in 1918 as a joint responsibility of the Board and the Foreign Office to encourage exports, was wholly absorbed by the Board after the Second World War.

The president of the Board of Trade, who is now assisted by two parliamentary secretaries, is the cabinet minister responsible to Parliament for the work of the Board in its widest sense. At present the Board has general responsibility for guiding and encouraging industry and commerce in the United Kingdom although particular industries, such as agriculture and fisheries, building, engineering, food, fuel and power, transport, and merchant shipbuilding, are the concern of other depts. The Board has also certain powers and duties in relation to the following: insurance and company law; bankruptcy; patents; weights and measures; administration of enemy property; the distribution of industry; the allocation of scarce raw materials; general price policy; the production and price control of a wide range of materials and manufs.; commercial relations with overseas countries; the promotion of exports; the economic aspect of reparations; and the census of production and distribution. Besides having the general charge of commercial policy, it fosters the work of Brit. firms overseas, and arranges Brit. participation in trade exhibitions. At home, the Board's activities include the organisation of the Brit. Industries Fair; encouragement of tourist trade; and pub. of the *Board of Trade Journal*.

**Trade Boards**, statutory bodies estab. under the T. B. Acts of 1909 and 1918. They formed part of the negotiating machinery in the settlement of industrial disputes, especially wage claims, and arise out of the arbitration boards set up prior to 1909 to settle disputes where collective bargaining failed to produce agreement between employers and workers. By the Act of 1909 T. B. were instituted in four trades (wholesale tailoring, box manuf., lace manuf., and chairmaking). The Board of Trade had power, however, to apply the Act to other trades. The chief object of the T. B. was to prevent sweating, especially in home and factory work (see SWEATING SYSTEM), since the workers in the industries in question were not sufficiently organised to protect themselves from exploitation.

The T. B. Act of 1918 extended the operation of T. Bs. to any industry where wage rates were considered by the minister of labour to be low or where any other means of settling wage rates by collective bargaining were lacking. As a result of the Act, 37 new T. Bs. were set up, but after 1922 on account of trade depression there was little further extension of the system. Under the Wages Councils Act of 1945 the function of the T. B. were taken over by the Wages Councils (*q.v.*). A T. B. consisted of members representing employers and workers in equal numbers, together with a number of independent persons known as Appointed Members, one of whom acted as chairman. Members normally held office for two years. It was obligatory for a Trade Board to fix minimum rates for time work; it could also fix other minimum rates, such as general minimum piece rates, special minimum piece rates, guaranteed time rate, overtime rates, etc. The deliberations of a Trade Board upon a question of wages were regulated by the rate the trade itself could economically afford. Although limited in their functions, T. B. proved an efficient means of improving conditions in many depressed trades. See also ARBITRATION; CONCILIATION IN INDUSTRY; INDUSTRIAL RELATIONS (BRITAIN); WAGES; WAGES COUNCILS.

**Trade Corporation**, see CORPORATION.

**Trade Cycle**, term for the fluctuation of prices, profits, and employment over a period of sev. years.

**Trade Diseases**, see OCCUPATIONAL DISEASES.

**Trade Disputes Acts**. These Acts seek to define (1) what a trade dispute is in the legal sense; (2) the legal position of persons involved in the dispute; and (3) the degree of legal protection persons affected especially by consequent intimidation or coercion, may claim. Strikes are not illegal *per se* at common law, but such Acts as the Conspiracy and Protection of Property Act, 1875, imposed penalties on combinations, whether of masters or workmen, which resulted in depriving the public of such essentials as gas and water. Various other statutes were passed up to 1875, when the legal position was consolidated under the

Combination Act of that year. It was not, however, until the Trades Disputes Act of 1906 that complete statutory immunity from civil and criminal liability was provided with respect to strike action. Other Acts followed, designed to clear the position regarding breach of contract consequent upon 'sympathetic' strikes, and in 1927, following the General Strike of 1926, new restrictions upon strike action, picketing, and sympathetic strikes were embodied in the Trades Disputes and Trade Unions Act (1927). The Act provided that any 'strike having any object other than, or in addition to, the furtherance of a trade dispute within the trade or industry in which the strikers are engaged is to be unlawful, if it is designed and calculated to coerce the gov., either directly or by inflicting hardship upon the community.' The Act also provided that a lock-out was illegal if it came under the same category. The Act further provided that picketing was to be deemed unlawful if the picket attended in such numbers or such manner as to intimidate any person. It will be seen that the Act possessed very wide powers, aimed at preventing a recurrence of a strike of similar magnitude to that of 1926. Since the General Strike, the Labour Party had placed the removal of this Act from the Statute Book in the forefront of the Party programme; and the presentation of the repeal Bill on Jan. 23, 1946, initiated an acrimonious conflict between the Labour gov. and the Conservative opposition. The second reading of the Bill was carried by 369 to 194 votes and the Royal Assent was signified in May, 1947.

**Trade Facilities Acts.** The economic and industrial depression of 1921 involved producers in great difficulty in finding sufficient capital either for the extension of business or for new ventures. In order to assist those who were unable to borrow capital in the ordinary way, owing to the stringency of supplies of money, a Trade Facilities Act was passed in 1921 whereby the Treasury guaranteed such loans under certain conditions. A limit of £25,000,000 was made, but this sum was soon exhausted, with many *bona-fide* applicants still anxious to take advantage of the gov.'s offer. Accordingly in 1926 a further Act was passed raising the limit to £75,000,000, the operation of the Act to expire in 1927. Most of the money thus raised was employed in shipping and railroad schemes. The acute shortage of capital available for schemes of development overseas brought about a Trade Facilities Act in 1924 by which loans were guaranteed up to three-quarters of their amount for the purpose of extending public utility ventures and expansion. The Sudan, Western Australia, and Newfoundland were the prime areas to benefit.

**Trade Mark (and Trade Names).** The law relating to the registration of T. M. is now the Trade Marks Act, 1938, which replaces and largely re-enacts the Trade Marks Act, 1905, the Trade Marks Act, 1919, and the Trade Marks (Amendment) Act of 1937. This last mentioned Act introduced important amendments con-

cerning the definition of a T. M., severance of the mark from the goodwill, and licensing of T. Ms. The Merchandise Marks Acts also deal with offences as to T. Ms. and trade descriptions from a penal point of view. Part of the Patents and Designs Act, 1907, as amended in 1928, which, so far as it concerns T. Ms., substituted 6 for 4 months as the term within which priority may be asked for an application for registration based upon a prior application, remains in force.

**Definition.**—The Act of 1937 defines a T. M. as 'a mark used or proposed to be used in relation to goods for the purpose of indicating, or so as to indicate, a connection in the course of trade between the goods and some person having the right either as proprietor or as registered user to use the mark, whether with or without any indication of the identity of that person.' As in the Trade Marks Act of 1905 the later Act includes in the term 'mark' a device, brand, heading, label, ticket, name, signature, word, letter, numeral, or any combination of these. A T. M. thus denotes the *producer* of a thing, and not the *thing produced*, and in that respect differs from a 'trade name.' To be valid, the mark chosen need not have any meaning, but whatever it is it must be distinctive. 'Distinctive' is defined as meaning 'adapted in relation to the goods in respect of which a T. M. is registered or proposed to be registered, to distinguish goods with which the proprietor is or may be connected in the course of trade from goods, in the case of which no such connection subsists, either generally or, where the T. M. is registered subject to limitations, in relation to use within the extent of the registration.' The actual distinctiveness of any given T. M. does not depend on abstract consideration of the nature of the mark itself but on the extent to which it has actually become distinctive by its use.

**Essential particulars.**—No mark will be registered under Part A of the register (*see infra*), unless it contains at least one of the following 'essential particulars': (i) The name of a company, individual, or firm represented in a special or particular manner (called 'name marks'). A surname alone is not the name of an individual and therefore does not come within the category of essential particulars. But on the other hand it may have acquired such notoriety in connection with the goods as to be deemed distinctive and registrable. (ii) The signature of the applicant for registration or some predecessor in his business. (iii) An invented word or words (called 'word marks'). Laudatory epithets are generally rejected; as also mere phonetic renderings of ordinary words even with a meaningless suffix.

As to the use of a word or words as the name or description of an article, sect. 15 of the 1938 Act provides that the registration is not to be deemed to have become invalid by any such use unless it is proved either: (a) that there is an established use of the word or words as the name or description of the article by a person carrying on a trade therein not

being used by the proprietor or a registered owner; or (b) that the article was formerly manufactured under a patent (being a patent in force at or granted after 23 Dec. 1919), that a period of two years or more after the cesser of the patent has elapsed, and that the word or words is or are the only practicable name or description of the article. (iv) A word or words having no direct reference to the character or quality of the goods, and not being according to its ordinary signification a geographical name or surname. (v) Any other distinctive mark, but a name, signature, or word or words, other than such as fall within the descriptions in i, ii, iii, and iv (*supra*), shall not be registrable under the provisions of this paragraph (*i.e.*, sect. 9 (c) of the Act of 1938) except upon evidence of its distinctiveness. But any special or distinctive word, letters, etc., used as a T. M. by the applicant or his business-predecessors prior to Aug. 13, 1875, which has continued in use without substantial alteration down to the date of the application for registration was registered under the Act of 1905 (*i.e.* irrespective of its failing to satisfy any of the 'essential particulars' above noted). A thin red line woven into the margin of tracing cloth was held to be a good mark, having been used as such for 50 years.

**Trade Marks which are not registrable.—Likely to deceive.**—It is unlawful to register as a T. M. any matter the use of which would be likely to deceive or cause confusion or would be disentitled to protection in a court or would be contrary to law or morality or any scandalous design, nor can a T. M. be registered in respect of any goods or description of goods which is identical with a T. M. belonging to a different proprietor which is already on the register in respect of the same goods or which so nearly resembles such a T. M. as to be likely to deceive or cause confusion. But in the case of honest concurrent user or other special circumstances, the court may permit the registration of T. Ms. which are identical, subject to such conditions as the court thinks fit to impose.

There are various particulars which are not permitted by the Acts and Rules to appear as or as a part of any registrable T. M. These are representations of the King or Queen or of any member of the Royal Family; words such as 'Patent', 'Patented', 'Registered', 'Copyright', etc. The following may not be used unless the proprietor of the mark containing such arms, etc., can show a right, if any, to such use:—(a) representations of the Royal or of the Imperial armorial bearings; insignia or devices so nearly resembling them as to lead to mistake. (b) The Brit. Royal or Imperial Crown. (c) The Brit. Royal, Imperial, or National flags. (d) anchor devices of the Admiralty, the eagle device and the wings of the R.A.F. (e) The words 'Royal' or 'Imperial.' (f) Any such words (such as 'Empire', 'Dominion', or 'Crown'), letters, or devices used so as to lead persons to think that the applicant has Royal

or Imperial patronage or authorisation.

**Concurrent user.**—Where a mark is used by three or more independent parties, the mark has usually been held to be common to the trade and will not be registered.

**Certification Trade Mark.**—A mark adapted in relation to any goods to distinguish in the course of trade goods certified by any person in respect of origin, material, mode of manuf., goods not so certified, is registrable as a certification T. M. in Part A of the register in respect of those goods, in the name, as proprietors thereof, of that person. Such mark cannot be registered in the name of a person who carries on a trade in goods of the kind certified.

**The Register, Part A and Part B.**—The Act of 1905 continued the system of registration then in use. It was found that the provisions of the Act of 1905 as regards what could be registered did not appear to admit of the registration of marks which had no actual distinctiveness at the moment but might reasonably become distinctive in the future. The somewhat cumbrous method was therefore adopted of setting up a separate register B for these marks. Under the Act of 1919 they were subjected to the disability that they could not be registered under Part B until they had been used at least two years in this country. By the T. Ms. Act of 1938 this disability was removed. By section 10 of the 1938 Act, to be registrable in Part B, the mark must be 'capable of distinguishing' goods in the manner stated above (*see* **DISTINCTIVE under Definition**); and in determining whether a T. M. is 'capable of distinguishing' the court may have regard to the extent to which (a) the T. M. is inherently so capable and (b) by reason of the use of the T. M. or any other circumstances the T. M. is in fact so capable. A mark may be registered by the same proprietor in both parts. The rules as to registration in the 'A' class are stricter than for 'B' marks, and confer higher rights; for registration under 'A', if valid, gives exclusive rights to the mark; that under 'B' is merely *prima facie* evidence of such right, and proof that a rival mark is not such as to deceive is a good defence. T. Ms. must be affixed in some way to the articles sold and thus again differ from a 'trade name' (which must not be confused with a 'name mark'). The Registrar's address is: Patent Office, Trade Marks Branch, 25 Southampton Buildings, London.

**Legal Remedies for infringement.**—In case of infringement, the injured party may choose between damages or having an account taken of profits. Registration is a condition precedent to the right to sue. In regard to *trade names* the law merely recognises a person's right to prevent others from personating his business by using any such description as would lead customers to confuse his goods with those of a trade rival. Brit. law recognises that where a person has used a T. M. in connection with his goods, so that it has become generally recognised as distinguishing his goods from those of others,

he acquires a common law right in such a mark. This proposition may be extended to include the general 'get up' of goods. But a proposal or intention to use a mark can give no common law rights.

**Ownership of T. Ms. with goodwill.**—The Act of 1938 permits the assignment of a T. M. with or without the goodwill and, if with goodwill, then for all or some only of the goods for which the mark is registered. It is also permissible for a registered user to license the use of the mark (consult section 22 and 23 of the Act of 1938).

**Registration with no intention to use the mark.**—It was formerly held that where registration of a mark had been obtained by a person who had no intention of using it, such registration was invalid and was not made valid by subsequent assignment to another person who intended to use or had used the mark. This disability has been to some extent removed by the Act of 1938 if either a body corporate is about to be constituted and the applicant intends to assign the mark to the corporation, or if the application to register the mark is accompanied by an application for the registration of a person as registered user of the T. M. and the court is satisfied that such person will be registered as such immediately after the registration of the T. M.

**Classification.**—For the purpose of registration of T. Ms. in the United Kingdom goods are classified in the manner set out in rules made under the Act of 1938. The classification serves as a ready means for bringing together T. Ms. relating to the same or similar trades. In the case of an application for registration in respect of all the goods mentioned in a class, or of a large variety of goods, the Registrar may refuse to accept the application unless he is satisfied that the specification is justified by the use of the mark which the applicant has made or intends to make if and when it is registered.

**Special legislation for protection of certain marks and for certain compulsory marks.**—Special legislation exists for the protection of the Red Cross mark or the words 'Red Cross' (Geneva Convention Act, 1911), the word 'Anzac' (*q.v.*) (The Anzac (Restriction on Trade Use of Word) Act, 1916), and the words 'Port' and 'Madeira' (Anglo-Portuguese Commercial Treaty Acts, 1914 and 1916). The use of a T. M. is voluntary, but in certain cases the manufacturer is compelled to stamp on goods a specified distinctive mark. Of such goods, gold and silver plate has, from the fifteenth century, been the most familiar example, and the most recent are imported watch cases, under an Act of 1907. Others are anchors and chain cables; butter, cheeses, and margarine (under the Food and Drugs (Adulteration) Act, 1928); gun barrels, under an Act of 1868; and, gunpowder, under an Act of 1875. Buyers and sellers in good faith of marked goods are protected by various provisions in the Merchandise Acts, 1887 to 1926. (See also **MERCHANDISE MARKS.**) There are

special provisions relating to false marking of particular goods such as linen, cutlery, dyed goods, and metal buttons.

**Registration of Business Names.**—The Registration of Business Names Act, 1916, and the Business Names Rules, 1917 and 1926 (made under the Act), provide for the registration of firms and individuals who carry on trade under a name other than their true name. Associations incorporated by Royal Charter now receive protection for their names and uniforms by the provisions of the Chartered Associations (Protection of Names and Uniforms) Act, 1926. Such associations as Boy Scouts, Girl Guides, and the Order of St. John of Jerusalem also receive the benefit of this Act by Order in Council. See R. Haddan, *A Compendium of Trade Mark Law and Practice* 1931-1942; J. and J. E. S. Ricardo, *Handbook on trade marks and trade names* (2nd ed.), 1939; A. H. Cousins and H. E. Wadsworth, *Trade Names*, 1946; T. A. B. White, *Trade Marks and the Law of unfair competition*, 1947; and Sir D. M. Kerly, *Law of Trade Marks and Trade Names* (7th ed.), 1947.

**Trade Organisation,** see **CHAMBERS OF COMMERCE; COMMERCIAL INTELLIGENCE DEPARTMENT; OVERSEAS TRADE DEPARTMENT OF; COMMERCIAL TRAVELLER; also EXHIBITIONS.**

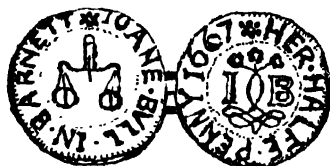
**Trades Councils,** local organisations in the Brit. trade union movement, consisting of representatives from the branches of the various trade unions in a tn. or dist. The T. C. first came into existence probably before 1850 but did not emerge as a wider organisation until ten years later. They were active in consolidating the labour movement and in 1868 were instrumental in the formation of the Trades Union Congress (*q.v.*). In 1865, however, they were excluded from the Congress in order to avoid dual representation of the affiliated trade unions. In Scotland they continued to be affiliated to the Scottish Trades Union Congress. In spite of their dis-affiliation in England they played an important, although undefined part in the movement, and where they existed they have been prominent in all local affairs whenever a united labour front was desirable. They gradually came to be recognised as the local agents of the Trades Union Congress and are now the channel for conveying information and ideas between the Congress and local trade union branches. Their official connection is through the T. C. Joint Consultative Committee consisting of six representatives of the Congress and six of the T. C. The Committee also appoints a fraternal delegate to attend the Ann. Congress. The function of the T. C. is therefore mainly administrative and they are excluded from political activity. They co-ordinate the activities of local branches but do not take part in formulating policy. They are linked nationally through a series of federations. It was estimated (1949) that there are over twenty federations comprising approximately 500 individual T. C. See also **TRADE UNIONS.**

**Tradescant Museum, see ASHMOLEAN.**

**Tradescantia (Zebrina),** an extensive genus of plants of the family Commelynacæ, native of S. America and India and named after John Tradescant the elder. At least 30 species are cultivated in Brit. flower-gardens.

*T. virginica*, the common spider-wort, is the one most usually grown in Britain, and bears purple blue flowers. Other species, such as *Zebrina discolor*, and *T. zebrina*, leaves purple beneath and white-striped above, are grown in green-houses. The name *Zebrina* has now replaced *T.*

**Tradesmen's Tokens, or Trade Tokens.** The official small change of England from Saxon times was of silver, which was coined in the Middle Ages to a value as low as a farthing. By the time of Elizabeth, however, the smallest piece was the half-penny, weighing only four grains, which was inconvenient and easily lost. Some change was essential and a more useful size and weight desired. In the reign of James I., the king delegated his prerogative of striking copper money to Lord Harrington, who was given a patent for striking farthings; similar patents were issued in the next reign, but were so grossly abused by the patentees, that, following a public outcry, the coins were suppressed by Parliament in 1644. On the death of Charles I. (1649) the exclusive royal prerogative of coining copper and brass ended, and tokens immediately began to be issued by tns., tradesmen, and, occasionally, by private persons. During the whole of the Commonwealth period no copper coinage was officially issued and tokens continued to be the small currency of the country. The tokens were usually struck in copper or brass, but lead was occasionally used.



A SEVENTEENTH-CENTURY TOKEN  
FROM BARNETT, HEARTFORDSHIRE

Left, obverse; right, reverse.

Their denominations were farthing, half-penny, and penny, though not many of the latter were minted. Generally speaking they were round in shape, but square, heart and diamond shaped and octagonal tokens were also made. The inscription on these tokens issued by tradesmen commonly consisted of the Christian and surname of the issuer, his trade and occupation and the tn. or vil. in which he resided. In addition they had the value, the initials of the issuer and a device. These designs were the arms of his trade guild, family arms, tavern- or shop-signs and a device indicating the issuer's handicraft or trade. A regal copper coinage

was started under Charles II. in 1672 and a Royal Proclamation announcing the new currency forbade the use of all others (i.e., tokens). In the eighteenth century industrialists were much exercised over the problem of obtaining small change in which to pay their employer's wages and Brit. industrial expansion during this period occurred at a time when the Royal Mint took a very restricted view of its duty to the public, so that tokens re-appeared in 1787-1801 and again in 1807-20, including latterly, silver and gold tokens. Legislation in 1817-23 finally stopped private minting.

**Trades Union Congress,** permanent central organisation of the Brit. trade union movement. It came into existence as the result of the Trade Union Conference which was held in Manchester in 1868 in order to secure the unity of the movement and to co-ordinate its activities. The following year the Congress appointed a Parl. Committee to further trade union interest in Parliament. The Parl. Labour Party itself owes its origin to a conference convened by the T.U.C. in 1900 to consider means of securing working-class representation in Parliament. In 1920 a General Council was created, which became the executive body, replacing the former Parl. Committee. It is elected by the Congress and holds office for one year. The Congress meets annually and is to-day representative of over 80 per cent. of the trade union membership. Any *bona-fide* trade union may apply for membership of the affiliation to the Congress, and delegates are appointed in the proportion of one to every 5000 members. The Congress has no authority to enforce its decisions upon any union, its recommendations operating upon the principle of counsel and consent.

There are eighteen groups of unions affiliated to the Congress, as follows, the number in parentheses indicating seats on the General Council: 1. Mining and Quarrying (3); 2. Railways (3); 3. Transport (3); 4. Shipbuilding (1); 5. Engineering (3); 6. Iron and Steel and Metal trades (2); 7. Building, Wood-working, Furnishing (2); 8. Printing and Paper (1); 9. Cotton (2); 10. Textiles (1); 11. Clothing (1); 12. Leather, Boot, and Shoe (1); 13. Glass, Pottery, Chemicals, Food, Drink, Tobacco, Brush-making, and Distribution (1); 14. Agriculture (1); 15. Public Employees (1); 16. Non-manual Workers (1); 17. General Workers (3); 18. Civil Service (1). The T.U.C. co-operates politically with the Parl. Labour Party, close contact being maintained through the National Council of Labour, on which the T.U.C., the Labour Party and the Co-operative Union are represented. The T.U.C. also forms with the Brit. Employers' Confederation a Joint Consultative Committee which advises the gov., and it has become customary for the gov. to consult the T.U.C. on major matters of industrial policy.

In international relations the T.U.C. supports the International Labour Organisation, being represented on its industrial Committee. In 1949 the T.U.C. with-

drew its membership from the World Federation of Trade Unions. Links between the T.U.C. and the trade union movement in other countries are preserved by representation on, *inter alia*, the Anglo-Fr. Trade Union Committee, and on Joint Committees of the two organisations in the U.S.A., the Amer. Federation of Labour and the Congress of Industrial Organisations.

The membership of the T.U.C. reached over a million by 1890. The Congress gained prestige during the First World War, and by 1920 its membership was 6,500,000. Following the General Strike of 1926 its members declined until by 1934 they had fallen to 3,295,000. Thereafter there has been a steady rise and in 1949 membership was 7,936,600.

The number of affiliated unions has decreased in recent years as a result of the fact that some smaller unions have dissolved and others have amalgamated. At the Eighty-first Ann. Congress held at Bridlington in Sept. 1949 there were 889 delegates from 187 affiliated unions. Trade union representation at this Congress is shown by the following table.

Trade Group	No of Unions	No. of Delegates	Member-ship
Mining and quarrying .	4	126	644,767
Railways . . . . .	3	42	620,841
Transport (other than railways) . . . . .	10	94	1,383,177
Shipbuilding . . . . .	4	16	122,810
Engineering, founding, and vehicle building . .	27	54	1,250,034
Iron and steel and minor metal trades .	20	42	193,275
Building, woodwork- ing and furnishing . .	20	53	592,737
Printing and paper . .	14	52	251,991
Cotton . . . . .	8	33	158,029
Textiles (other than cotton) . . . . .	23	36	111,751
Clothing . . . . .	5	23	172,473
Leather, boot and shoe .	6	18	115,898
Glass, pottery, food, chemicals, etc. . . . .	15	63	479,883
Agriculture . . . . .	1	16	135,000
Public employees . . .	4	23	225,017
Civil service . . . . .	7	56	429,211
Non-manual workers . .	12	45	225,740
General workers . . . .	4	62	823,963
<b>TOTALS</b> . . . . .	<b>187</b>	<b>889</b>	<b>7,936,600</b>

The Scottish T.U.C. is a similar organisation incorporating the Scottish trade unions and the Scottish branches of larger unions already affiliated to the T.U.C. There are therefore strong links between the two organisations. It has a membership of over 600,000. In Ireland there are two organisations—the Congress of Irish Unions with a membership of about 80,000 drawn mostly from unions in Eire

and the Irish T.U.C., the parent body with some 120,000 members, divided between Eire and N. Ireland. For bibliography, see under TRADE UNIONS.

**Trade Unions**, associations of employed workers, formed primarily for the purpose of substituting collective for individual bargaining, though they act in many cases also as friendly societies, and take part in other activities related to their main purpose, such as politics and working-class education. T. U. existed in Great Britain long before the Industrial Revolution and were powerful and highly organised among the skilled crafts in the eighteenth century; but they owe their main social and economic importance to the rise of the modern factory system based on power-production. They exist in agriculture as well as in industry. There are T. U. in all modern industrial countries, and the movement attained importance in Japan and India, as well as in Europe and America. Usually, the most important T. U. in each country are joined together in a congress or federation, such as the Trades Union Congress (*q.v.*) in Great Britain, which acts as their spokesman on matters of general concern.

The primary purpose of T. U. is collective bargaining, based ultimately on the right to strike. But the strike is, in fact, usually invoked only as a last resort. T. U. greatly prefer to settle questions by means of negotiation, either with employers singly or, more often nowadays, with Employers' Associations or Federations, or direct with the State.

The T. U. movement is now practically world-wide. It has reached its greatest strength in the U.S.S.R. where for the first time T. U. were part of a uniformly nationalised economy, and with a membership of about 15,000,000 are a means of organising the labour force of the country in the interests of the State. These T. U., however, cannot be compared with those of W. Europe, since the Soviet system has no place for the principles of collective bargaining, etc., or of strike action as this would, in effect, be action against the State. Germany was with Great Britain one of the countries of Europe in which T. U. were most strongly organised before they were suppressed under the Nazi régime. During the period of the Weimar Republic membership reached about 6,500,000. After the Second World War the revival of T. U. was recognised under the Potsdam Agreement, and during the period of military occupation membership reached a total of about 7,000,000, of which more than half were in the Russian Zone of occupation. In Oct. 1949, 800 delegates representing sixteen T. U. in the Brit., Amer., and Fr. Zones met together in Munich for the purpose of forming a Ger. federation of all T. U. in the W. zones.

In France trade unionism grew in strength more slowly than in Great Britain or Germany, partly because there was more small-scale industry. Since the Second World War it has become a powerful force in the country, although



there is a political div. between the three largest groups, i.e. the *Confédération Générale du Travail*, which is mainly Communist in sympathy, the *Force Ouvrière*, which is Socialist, and the *Confédération Française des Travailleurs Chrétiens*, a Catholic group.

**TRADE UNIONISM IN GREAT BRITAIN.**—The movement achieved its legal emancipation first in Great Britain, where modern industrialism first developed on a large scale. Up to 1824 there were many statutes in existence forbidding working-class combination, either generally or in particular trades. The earliest general Act dates from the reign of Edward VI. General Acts prohibiting combination were passed in 1799 and 1800, when the Brit. governing class was in fear of popular movements following on the Fr. Revolution of 1789 (incidentally, the revolutionary gov. in France also prohibited T.U., under the *Loi Chapelier* of 1791, and T. U. only received legal recognition in France in any full sense in 1884). The Eng. Combination Acts were repealed in 1824, after an agitation engineered by Francis Place and the Radicals, but stringent restrictions on T. U. activity were re-imposed in 1825, and the T. U. only secured adequate legal recognition in 1871–75. Prohibitions and restrictions were, however, unsuccessful in preventing working-class combinations, though they sometimes drove them underground, and many leaders were imprisoned for taking part in the work of organisation or attempting to apply collective bargaining. The hist. of Brit. trade unionism falls, roughly, into seven periods. (1) During and before the eighteenth century trade unionism was for the most part confined to skilled craft-workers, organised in small local Trade Clubs which only linked up occasionally over a wider area. These clubs were sometimes powerful, as they had a monopoly of skilled labour. Their main functions were to negotiate with employers (mostly small employers) as to wages and hrs., to enforce limitation of apprenticeship, and to act as friendly societies. Until 1813 the magistrates still had power under the Elizabethan Statute of Artificers to regulate wages, and until 1814 to regulate apprenticeship, and often the object of the T. U. was the enforcement of the Elizabethan statute. These provisions were repealed in 1813 and 1814 under the influence of the new doctrines of *laissez-faire*. (2) From 1799 to 1824 trade unionism was forbidden under the Combination Acts. It continued to exist, and in some trades to negotiate with the employers openly and without prosecution. But T. U. in the mining and textile trades were subject to severe repression, and unable to maintain a continuous existence, though new societies constantly sprang up in place of those which were dissolved. (3) The repeal of the Combination Acts in 1824 was followed by a great wave of T. U. activity, culminating in the formation of the Grand National Consolidated Trades Union, under Robert Owen's influence, in 1833. But this body was destroyed in

the following year after a series of strikes and lock-outs, and after the famous 'Dorchester Labourers,' who had formed an agric. branch, had been transported for the offence of administering unlawful oaths (see *TOLPUDDLE MARTYRS*). (4) After 1834 the work of organisation began anew on less ambitious lines. General unionism went out of fashion (though there was a revival of it in 1845–48), and attention was concentrated on building up stable unions in particular trades. The National Miners' Association (1841) came to grief, but from 1850 onwards powerful societies grew up, such as the Amalgamated Society of Engineers (1851), relying on high contributions and a mingling of industrial and friendly benefits to ensure stability of membership. This method was effective in organising skilled workers, but left unorganised the lower paid workers, who could not afford the high contributions exacted. Under the moderate leadership of the new Amalgamated Societies of skilled workers the T. U. at length secured legal recognition under the Trade Union Act of 1871. This was at first combined with repressive measures against coercion and intimidation, under the Criminal Law Amendment Act of 1871, but the T. U. strengthened by the Reform Act of 1867, which gave the urban workers the vote, got this Act replaced by the milder Conspiracy and Protection of Property Act of 1875. During the prosperous years between 1869 and 1874 trade unionism spread to the less skilled workers and, under Joseph Arch's leadership, to the agric. labourers. But in the middle 'seventies came a slump in trade, which largely destroyed the unions' power. They were reduced to quiescence, until the revival of 1888–89. (5) The Miners' Federation was formed in 1888; and in the following year the London Dockers' strike was the beginning of a big movement of agitation among the less-skilled workers. This period marks the revival of Socialist influence in the T. U., for the 'New Unionism' was largely organised and directed by Socialists. It was the beginning of the 'General' Unions, enrolling unskilled workers, which in power and influence came to supersede the earlier 'Craft' Unions. Under Socialist inspiration, the Unions not only began to supplement collective bargaining with demands for industrial legislation (already a familiar policy among the miners and textile workers), but also to consider taking political action as an independent working-class party. Under Keir Hardie's leadership, the Socialist Independent Labour Party (1893) undertook a vigorous campaign with the object of bringing the T. U. into politics, and in 1900 the Trades Union Congress was persuaded to launch, in partnership with the Socialist bodies, the Labour Representation Committee, which in 1906 adopted the name 'Labour Party.' (6) The progress of the L.R.C. was slow at first, but an important legal decision threatening the existence of trade unionism rallied the T. U. movement behind it. This was the *Taff Vale* decision (1902), by which it was laid down that

T. U. funds could be made liable for damage caused by a trade dispute. The agitation against this decision led to the winning of a large number of seats by the Labour Party in the General Election of 1906, and to the passing of the Trade Disputes Act (1906), which remedied the grievance. But immediately the T. U. suffered a further setback in the courts, the Osborne Judgment (1908) declaring political action by T. U. unlawful. Further agitation followed, until this grievance was in part remedied by the Trade Union Act of 1913. In the meantime, the failure of wages to rise with increasing prices and national wealth had led, in 1911 and the following years, to a great movement of unrest and strikes (transport workers 1911 and 1912, miners 1912), and to the emergence of new social theories such as Syndicalism and Guild Socialism, claiming a large share in the control of industry for the organised workers. This movement of unrest continued in being up to the outbreak of war in 1914. (7) The war, after an initial setback, greatly increased the membership and power of the T. U. owing to the high demand for labour and the necessity of constant negotiations as prices rose and industrial methods had to be modified in face of war conditions. The T. U. emerged from the war with doubled membership, into a period of acute unrest. There were many big strikes between 1919 and 1921, when the coming of the great post-war depression seriously limited the power of the unions. But politically the strength of the Labour Party continued to grow, and a minority Labour Gov. came into office for a brief period in 1924. The fall of this gov. was followed by a renewal of industrial strife, culminating in the miners' lock-out and the General Strike of 1926, when the Trades Union Congress organised a national strike movement in support of the miners' claim to a living wage. The defeat of the General Strike was followed by the Trade Disputes and T. U. Act of 1927, which not only declared general and sympathetic strikes to be illegal, but also withdrew many of the privileges gained by the T. U. under previous Acts, and left the law in a condition of dangerous ambiguity on many vital matters. A second Labour Gov. held office, in a minority, from 1929 to 1931, when it fell as a result of the financial crisis arising out of the world slump. Meanwhile, in the industrial field, the T. U. remained perforce on the defensive, owing to the general depression. Their membership had fallen heavily since the years of boom after the war; and their power was further menaced by the decline of the older industries, in which their strength mainly lay, and the rise of new mechanical trades operated more largely with unskilled labour. Numbers continued to decline until they fell below four and a half millions by 1933. After that year economic conditions slowly improved, and by the outbreak of war in 1939 membership was back to the six million mark, which had not been touched since 1921. An important development was that the right

of T. U. to negotiate on behalf of apprentices was recognised by employers. One feature of this period was the increasing use of advisory councils and committees in the relations between various T. U. The structure of trade unionism and the question of closer unity engaged the attention of the General Council of the Trades Union Congress, throughout the thirties. The ground was therefore well prepared in the thirties to make possible the important share which trade unionism had in the industrial effort of Great Britain during the Second World War. Trade unionism had by now become an instrument of gov. and was more intimately concerned than formerly with industrial policy. One of the first acts of the Labour Gov. which came to power in 1945 was to repeal the Trade Disputes and T. U. Act of 1927, and this was done on May 22, 1946. Thus the T. U. regained their full status as an integral part of the State. With the nationalisation of coal-mining, electricity, and other industries, provision was made for consultative councils consisting of representatives of the Boards of the nationalised industries and the staff concerned.

*Organisation.*—A union is usually a national body with branches distributed over the whole country. Its branch officers are industrial workers, giving only their spare time to union duties, but it maintains a head office staff of full-time officials, who manage its affairs under the direction of a part-time executive committee and an ann., biennial, or triennial congress or conference of delegates from the branches or dists. Naturally the precise form of organisation differs from union to union, but these are the common factors.

Types of T. U. fall into four main groups: first, the craft unions, the earliest form of trade unionism. Their membership is limited to skilled workers engaged in the same industrial employment or near allied employment. They tend to be small in size although there are a few craft unions among the largest, e.g. the Amalgamated Weavers' Association, the Electrical Trades Union, and the Amalgamated Engineering Union. The two last, however, take on some of the characteristics of the second group, the Industrial Unions. The industrial unions include both skilled and unskilled workers within a given industry. Important examples of industrial unions are the National Union of Mineworkers, the National Union of Railwaymen, and the Iron and Steel Trades Confederation. The third group, the Occupational Unions, are smaller T. U. consisting of those engaged in one particular class of work within the same industry, e.g. the Railway Clerks' Association. Finally, there are the General Unions, e.g. the two largest, the Transport and General Workers' Union and the National Union of General and Municipal Workers, which cater for both skilled and unskilled workers in a number of different classes of employment. Among non-manual workers, teachers, post-office workers, civil servants, municipal workers,

journalists are, among others, all strongly combined, and many of the unions of non-manual workers are linked up in the National Federation of Professional Workers, which maintains close relations with the T.U.C. In almost every tn. of importance there is a Trades Council, a federation of the local branches of the various T. U. See TRADES COUNCILS.

Almost all T. U. except those in the public services, provide benefits for their members in case of strikes or lock-outs. In many unions the expenses of management and negotiation, together with those of strike benefit, absorb nearly all the funds. Under Brit. law, payments for political purposes have to be made out of a separate fund, to which contribution is voluntary; and political payments account for only a very small part of total T. U. expenditure. Contributions to the General Funds of the T. U. are payable weekly, and range in most cases from 6d. to 2s. a week, with lower rates for women members, youths, and apprentices. In some T. U. in other countries (e.g. France) contributions are much lower than in Great Britain, and friendly benefits hardly exist. In America, on the other hand, contributions are substantially higher.

As regards political organisation, over seventy T. U. are affiliated to the Labour Party which has an affiliated trade union membership of two and a half millions, about eighty per cent of the total. T. U. are represented at the ann. conference of the Labour Party by delegates from the various affiliated organisations at the rate of one delegate per five thousand members. Local branches of T. U. may also affiliate with local branches of the Labour Party. Regional Councils of Labour have also been created by the Labour Party to serve as links between the National Executive and local affiliated organisations, such as T. U., at dist. level.

**Educational Activities.**—The provision of increased educational facilities for its members has been a recognised aim of trade unionism since the beginning of the movement. About 100,000 students are enrolled in the Workers' Educational Association, a section of which is devoted solely to the needs of members of T. U. See ADULT EDUCATION.

**Statistics.**—The number of T. U. in the United Kingdom is 730 (1948), including 24 with headquarters in N. Ireland. Of these 416 are registered with the Chief Registrar of Friendly Societies under the Trades Union Acts. Membership in the U.K. was 9,301,490. The largest are the Transport and General Workers Union, the National Union of General and Municipal Workers, the Amalgamated Engineering Union, the National Union of Mineworkers, the National Union of Railwaymen, the National Union of Distributive and Allied Workers, the Amalgamated Society of Woodworkers, the Electrical Trades Union, the National Union of Tailors and Garment Makers, and the National Union of Agric. Workers. The industrial distribution of T. U. membership (1948) is shown by the

table at the top of the following page.

The growth of trade unionism in the United Kingdom is shown by the following figures for selected years. At the height of the movement in the early part of the nineteenth century, T. U. membership is said to have risen to a million (1834), but this figure is open to doubt. There are no official figures before 1892, in which year total membership was 1,500,000. It reached 2,000,000 in 1906, 3,000,000 in 1911, 4,000,000 in 1913, 5,000,000 in 1917, 6,000,000 in 1918, 7,000,000 in 1919, and 8,000,000 in 1920. In 1921 it fell to 6,600,000 and further declined to under 5,000,000 in 1927. A small increase in 1927 was not maintained, and the lowest figure since 1915 was reached with 4,400,000 in 1933. Thereafter it rose to 5,000,000 in 1936, 6,000,000 in 1938, 7,000,000 in 1941, 8,000,000 in 1943. In 1945 there was a drop to 7,800,000 as a result of women leaving industry after the war, but the numbers again increased to their present total of over 9,000,000.

**Trade Unionism in the U.S.A.**—In the U.S.A. the beginnings of labour organisation date back to the days of Washington. Robert Owen carried his theories and practice to America when he set up a community at New Harmony in Indiana on the lines of the New Lanark experiment. By 1833 there were over a hundred T. U. in existence in Philadelphia, New York, Baltimore, and Boston. An attempt to form a national federation in 1834 was, however, short-lived. After the Civil war the growth of Amer. industrialism brought a parallel growth to the craft unions which were, however, heavily handicapped by the opposition of employers and the constant dilution of labour by immigration. In 1866 the National Labor Organisation was formed but lasted only six years, the difficulty being to unite local and national interests, immediate benefits and wider ideals. A second organisation, the Noble Order of the Knights of Labor, fl. for a few years, especially among unskilled workers, but it roused the opposition of the craft unions. It was not until 1886 that Amer. labour was put on a firmer national basis with the creation of the Amer. Federation of Labor. This was largely due to the energy and vision of Samuel Gompers (1850-1924) (q.v.), a member of the Cigar-makers Union, who succeeded in bringing together the leaders of the larger national unions, including the iron and steel workers. The first major conflict was the nation-wide railway strike of 1877, ended only by bringing the Federal troops into action against the strikers. Trade unionism was considered to be broken, but it continued its struggle towards more powerful organisation. A weapon used against the T. U. from time to time was the practice allowed to both state and federal courts of issuing a writ of injunction, forbidding the unions to take any action they proposed if held to be likely to cause damage. An injunction could therefore, and was, used as a strike-breaking instrument. Nevertheless, legis-

Trade Groups : United Kingdom	Men	Women	Total Membership
General labour organisations .. ..	1,846,700	293,860	2,140,560
Agriculture, Forestry, and Fishing .. ..	170,870	10,840	181,710
Coalmining .. ..	769,340	15,390	784,730
Other mining and quarries .. ..	7,470	440	7,910
Treatment of non-ferrous and mining products other than coal .. ..	15,880	17,110	32,990
Chemicals and Allied Trades .. ..	14,180	6,150	20,330
Metal manufacturing; Engineering; Shipbuilding; Electrical groups; Vehicles and other metal trades .. ..	1,599,790	67,070	1,666,860
Cotton .. ..	72,680	156,610	229,290
Other Textiles and Textile Finishing .. ..	87,510	85,200	172,710
Leather, Leather groups, and fur .. ..	13,930	3,590	17,520
Clothing (except boots and shoes) .. ..	35,700	104,210	139,910
Boots, Shoes, and Slippers .. ..	62,810	34,900	97,710
Food, Drink, and Tobacco .. ..	53,590	19,220	72,810
Manufacture of Wood and Cork .. ..	103,880	14,140	118,020
Paper and Printing .. ..	196,610	63,420	260,030
Other Manufacturing Industries .. ..	11,630	3,630	15,260
Building and Contracting .. ..	501,030	180	501,210
Gas, Electricity, and Water .. ..	26,250	2,680	28,930
Railways .. ..	596,200	31,140	627,340
Other Transport and communications (excluding General Labour Unions) .. ..	379,150	56,030	435,480
Distributive Trades .. ..	216,420	139,860	386,280
Insurance, Banking, and Finance .. ..	75,710	16,040	91,750
National Government Services .. ..	229,770	123,370	353,140
Local Government Services .. ..	249,690	101,320	351,010
Education .. ..	111,300	184,150	295,450
Other Professional Business Services .. ..	87,190	93,190	180,380
Theatres, Cinemas, Sports, etc .. ..	61,160	21,900	83,060
Other Services .. ..	2,710	320	3,030
TOTALS .. ..	7,632,450	1,669,010	9,301,490

lation favourable to labour was introduced in a number of States, and in 1884 a Federal Bureau of Labor was set up, the forerunner of a State dept. Public opinion was on the whole against the severity with which a second railway strike was suppressed in 1886 also by armed force. T. U. slowly came to be recognised as an integral part of industrial life and employers were more and more urged to settle disputes with the T. U. by arbitration. In 1900 the Amer. Federation of Labor had a membership of only a little over half a million. By 1914 it was over two million. Women employees were also organised in a common effort towards obtaining better labour conditions, and the National Women's Trade Union League was formed in 1903. From the beginning of the First World War the wages and living conditions of Amer. workers began to improve considerably. The Amer. Federation carried on a long campaign against unrestricted immigration, especially of classes likely to lower the standard of labour. By 1927 it was successful in securing legislation limiting immigration to an ann. quota or proportion of any nationality already represented in the U.S.A. In July 1935 labour's position was further advanced by the creation of the National Labor Relations Board under an Act known as

the Wagner Act. Its purpose was to conduct elections by secret ballot among union members on receiving a strike petition from the union concerned, to remedy unfair labour practices on the part of an employer, and to prevent any discrimination against employees on account of union membership. The following year the Amer. Federation of Labor met with opposition, within the movement, to the form of craft unionism which it favoured. A move in favour of industrial unionism was led by John L. Lewis (*q.v.*), president of the United Mineworkers of America, who broke away from the Federation and formed a separate body called the Committee of Industrial Organization (later, the Congress of Industrial Organizations). In the next few years he was successful in encouraging trade unionism in the steel and motor industries in which craft unionism had failed to gain a hold. By 1940 the C.I.O. claimed a membership of five million as against the four million of the Amer. Federation. In that year an unsuccessful attempt sponsored by President Roosevelt was made to bring the two organisations together. In 1943 Lewis led the mineworkers into a strike for higher wages, damaging though this was to the Amer. war effort. A Bill was hurriedly passed through Congress, making strikes illegal unless approved by a

majority by secret ballot, and refusing to allow T. U. to contribute to political funds. In 1946, the year of a second coal strike, the United Mineworkers were re-affiliated to the Amer. Federation. At this time both the Federation and the C.I.O. found themselves united in denouncing the Labor Management Relations Act (1947) known as the Taft-Hartley Act, which replaced the Wagner Act of 1935, being passed over President Truman's veto. This law enjoined a sixty-day notice of strike or lock-out, and gave the President power to impose a further eighty days' postponement. It made the closed-shop illegal and forbade T. U. to compel their members to obey union policy. T. U. were also prevented from using their funds for political purposes. The Act also brought the Communist issue to a head. It stipulated that any union wishing to take advantage of the services of the National Labor Relations Board must first certify that none of its officials was Communist. Both the Amer. Federation and the Congress of Industrial Organization subscribed to this, although deploring the compulsion, as they were opposed to Communism. John L. Lewis, however, objected on principle and withdrew from the Federation. The United Mineworkers therefore stood outside both the Federation and the C.I.O. and became one of the largest of the independent unions. The Taft-Hartley Act was unsuccessful in stopping the growth of the power of the T. U., especially as full employment was reaching a new total of sixty million jobs. By 1949 total membership of T. U. was reckoned to be 16,000,000. The Amer. Federation of Labor claimed a membership of over 8,000,000 as against 6,000,000 claimed by the Committee of Industrial Organisation. By far the largest union within the Federation is the International Brotherhood of Teamsters with a membership of over 1,103,000, followed by the United Brotherhood of Carpenters and Joiners with 735,000. The three largest unions in the C.I.O. are the United Steelworkers of America, and the Automobile Workers, each with a membership of over 940,000. The United Electrical, Radio, and Machine Workers union (600,000 in 1948) was expelled from the C.I.O. in 1949. The independent T. U. account for about 2,000,000. Among them are the International Association of Machinists, 581,900, and the United Mineworkers of America, 600,000. A group of railway unions, of which the largest is the Brotherhood of Railroad Trainmen with a membership of over 210,000, are also independent and together make a total of about 500,000.

**International Trade Unionism.**—In its international aspects the tendency within the movement has been towards co-operation and fraternal association between national confederations of T. U. and also between individual unions and federations of unions representing specific trades in various countries, e.g. the International Transport Workers' Federation and the Miners' International Federation. The

International Working Men's Association ('The First International') was formed in 1863 and held its first meeting in London in that year. It continued its ann. congresses, leading a rather troubled existence, until 1872 when it lapsed, but was revived in 1889 ('The Second International'). It was later superseded by the International Federation of Trades Unions, which existed for the interchange of information and ideas rather than for the formation of industrial policy applicable to its member countries. The I.F.T.U. declined during the First World War, but after the war its membership increased to over 18,000,000. More prominent were the activities of the International Labour Organisation (g.v.), set up under the League of Nations and now within the United Nations Organisation. A further step towards international unity was a resolution passed by the Trades Union Congress at Southport in 1943, advocating a world conference of T. U. The conference opened in London on Feb. 6, 1945. As a result the World Federation of T. U. came into existence and held its inaugural meeting in Paris on Oct. 3, 1945. It represented over 66 million workers in fifty-six countries, and within two years it comprised seventy-one organisations representing 70 million workers. Its purpose was to promote unity of aim and action of the international T. U. movement, and with this wider function it superseded the I.F.T.U., which was dissolved in Dec. 1945. Proposals were subsequently made to dissolve the international federations of separate trades and industries and transfer their functions to Trade Depts. within the World Federation of T. U. The World Federation of T. U. suffered a setback in 1948 as the result of a split between the representatives of the predominantly Communist countries and those which were non-Communist, and the Trades Union Congress, the Congress of Industrial Organisation (U.S.A.), and the Dutch Federation of T. U. withdrew their membership on Jan. 25, 1949. The Amer. Federation of Labor, which shares with the C.I.O. the representation of labour in the U.S.A., had remained outside the World Federation of T. U. from the beginning. A manifesto describing the World Federation as dominated by Communist organisations was issued by the Secessionists in March, 1949, and their example was followed by the T. U. federations or councils of *inter alia*, Australia, New Zealand, Belgium, Switzerland, and Sweden. With the intention of forming a new International T. U. organisation, the secessionist bodies held a conference which met in Geneva in June 1949. It was attended by 127 delegates from thirty-eight national federations of T. U., representing over 45,000,000 members. The congress of the World Federation of T. U. which was also held in June-July, 1949, represented 71,000,000 T. U. members from forty-five countries. As a result of this congress a separate Asian Federation of Labour was set up under the auspices

of the World Federation. On Dec. 7 (1949), the free trade unions, at a conference in London, estab. the International Confederation of Free Trade Unions with about 50,000,000 members. and with headquarters in Brussels.

**Bibliography.**—The standard hist. for Great Britain is S. and B. Webb, *History of Trade Unionism* (revised 1920). For descriptions of the Brit. movements, see G. D. H. Cole, *Organised Labour*, 1924; A. Henderson, *Trade Union Law*, 1925; J. W. F. Rowe, *Wages in Practice and Theory*, 1928; E. Bevin, *The Union, Its Works and Problems*, 1939; N. Baron, *British Trade Unions*, 1947; G. D. H. Cole, *A Short History of the British Working-Class Movement*, rev. ed., 1948; M. Turner-Samuels, *British Trade Unions*, 1949; *British Unionism*, Six Studies by 'Political and Economic Planning', 1948, and H. Samuels, *The Law of Trade Unions*, 1949. For Trade Unionism in other countries there is no general book in Eng. See L. Levine, *Syndicalism in France*, 1912; P. Louis, *Le Syndicalisme Européen*, 1914; R. W. Dunn, *Soviet Trade Unions*, 1928; and a series of small books published by the International Federation of Trade Unions describing the movement in different countries.

**Trade Winds**, currents of air on the earth's surface travelling between the high-pressure belt of the sub-tropics and the low pressure of the equatorial belt. Their discovery is generally attributed to Columbus on his first transatlantic voyage in 1492, although they may have been known before that. Allowing for the normal frictional difference between surface wind and gradient wind (see *further under WIND*) the trades follow the normal circulation round the semi-permanent anticyclones over the oceans in about 30° N. or S. In the extreme E. of such an anticyclone in the N. hemisphere the winds are N. to N.E. and veer steadily to N.E. in the S. and to E. or a little S. of E. in the extreme W. where they are, however, not quite so marked. The main area of the trades is in the E. and S. half of the anticyclone where the wind is clearly N.E. with a strength of about 10–15 m.p.h. A similar effect is noticed in the S. hemisphere. In March the positions are: N.E. (Atlantic) 3°–26° N.; (Pacific) 5°–26° N.; S.E. (Atlantic) 0°–25° S.; (Pacific) 3°–28° S. In Sept. N.E. (Atlantic) 11°–35° N.; (Pacific) 10°–30° N.; S.E. (Atlantic) 3°–25° S.; (Pacific) 7°–20° S. From March to July each belt swings northwards; from Sept. to Jan. southwards. Their steadiness of strength and direction led to the name trade (trend). At their origin they are dry, fresh, gentle breezes, but they gradually become damp and stronger, cumulus cloud of characteristic nature forming. The regions are marked by little rainfall and greater salinity over the ocean. Land regions to the E. of the trades are very dry, tending to desert conditions, but to the W. (i.e. the E. coasts of the continents) they cause much rainfall. With hotter air over the subtropical continents than

over the sea, high pressure tends to form over land at high levels, and the upper winds therefore circulate round the continents, *counter-trades* or *anti-trades* as they are called, being at lower levels (3000–6000 ft.) near the continents than well out to sea and farther W., but the height of the change-over is variable. The direction is usually S.W. in the N. hemisphere and N.W. in the S. hemisphere, but the term should not be applied to the prevailing winds of similar direction in temp. latitudes which usually exist up to all heights. *Reversed trades* occur particularly in the Indian Ocean during the summer, when they form the S.W. monsoons. They succeed in 'dragging' the S.E. trades across the equator, the doldrums thus not occurring.

**Traducianism**, theory that souls are propagated in a similar way to the procreation of the body. See Tertullian's treatise *De anima*. In church hist., St. Augustine seems to have inclined to this belief, without committing himself to it or, on the other hand, pronouncing in favour of the opinion that the soul was immediately created by God and infused into the embryo when sufficiently organised. The orthodox party were called *Traducianists* by the Pelagians, in connection with the doctrine of the transmission of original sin.

**Trafalgar**, cape on the S. coast of Spain, and the scene of the great naval victory of the Eng. fleet under Lord Nelson over the combined Fr. and Sp. fleets under Villeneuve on Oct. 21, 1805. This battle shattered the power of France and Spain at sea at a time when Napoleon had made himself master of Europe and protector of the Confederation of the Rhine. In the winter of 1804 Nelson watched Toulon harbour, where the Fr. were preparing to embark a large body of troops for some unknown destination. Nelson sailed for Barcelona to draw them out, and in his absence Villeneuve with ten ships-of-the-line and many frigates put to sea (Jan. 18, 1805). Nelson, believing Villeneuve to be going to Egypt, himself sailed for Sicily, but Villeneuve had passed the Straits of Gibraltar and effected a junction with the Sp. fleet at Cadiz. Nelson, on learning this, chased Villeneuve to the W. Indies, whence the Fr., in terror of his name, returned without accomplishing anything. Nelson returned in pursuit, but learning that the enemy had arrived at Cadiz, he returned to England, but immediately volunteered his services again, and joined Collingwood's squadron off Cadiz (Sept. 29). Early in Oct. Nelson received information from which he concluded the enemy would soon put to sea, and having on Oct. 4 laid before his admirals and captains a simple mode of attack, he disposed his fleet in such a manner as to tempt the enemy to come out. The enemy put to sea on the 19th. The Brit. fleet consisted of 32 sail-of-the-line and 5 frigates. Perhaps the most remarkable phase of the battle itself was the desperate struggle between the *Victory* and *Téméraire* on the one side and the *Redoubtable* and the *Fougueux* on the other. It was

a shot from the cross-trees of the *Redoubtable* that killed Nelson. The Brit. casualties were 450 killed and 1250 wounded. Nineteen of the enemy's fleet (which had comprised thirty-three sail-of-the-line and seven frigates) were captured and one blown up. The prisoners numbered 12,000. The result of the victory saved England from all chance of an invasion and paved the way for the ultimate success of the Anglo-Russian treaty to resist the encroachments of France and to secure the independence of Europe. See J. S. Corbett, *The Campaign of Trafalgar*, 1910; R. H. Mackenzie, *Trafalgar Roll*, 1913; A. F. Freemantle, *Trafalgar*, 1933.

**Trafalgar Square**, open space on the N. side of Charing Cross, London. It was laid out to commemorate the battle of Trafalgar, its construction being begun in 1829 but not completed until 1867. The design was by Sir Charles Barry, though modified. The central feature is the Nelson Column, 145 ft. high, surmounted by a statue of the admiral, with bas reliefs of his battles at the base, and four bronze lions at the bottom of each corner. There are also ornamental fountains. On the N. side of T. S. is the National Gallery, on the E. side S. Africa House, and on the W. side Canada Building.

**Traffic Regulations and Signs** are made under the Road Traffic Act, 1930, for the control of motor vehicles. The regulations which came into force Dec. 1, 1930, revoked the Motor Car (Registration and Licensing) Order, 1903, and the Motor Car Registration and Licensing (Scotland) Order, 1903. Under the Act of 1930 the co. council or the co. bor. is the licensing authority for the local residents, and any such council is the licensing authority for applications not resident in Great Britain. The cost of a driving licence is 5s. The Act provides for tests of fitness to drive, but an applicant for a licence is not entitled to claim to be subjected to a test as to his fitness or ability to drive a motor vehicle if he is an epileptic liable to sudden attacks of disabling giddiness or fainting, or if he is unable to read at a distance of 25 yds. in good daylight (with the aid of glasses, if worn) a number plate containing letters and figures. The fee for the test in the case of applicants who are entitled to claim is 7s. 6d. (2s. 6d. in the case of a test conducted with an invalid carriage, a mowing machine, or vehicle controlled by a pedestrian or certain other exempted vehicles). A driving-test examiner must be satisfied that the applicant is fully conversant with the *Highway Code*, and that he is competent to drive (without danger to and with due consideration for other users of the road) a vehicle of the same class or description as that on which he is tested. Failure of a licensee to sign his licence renders him liable to a fine not exceeding £5. Signals to be employed by drivers and those regulating traffic are given in *The Highway Code*. T. R. and S. have a twofold object—the avoidance of congestion and the promotion of safety. In busy thoroughfares in

most tns. in Great Britain and U.S.A., traffic is controlled by automatic light signals. In Great Britain speed is reduced to 30 m.p.h. in built-up areas as a safety measure. Multiple carriage-ways, rotary movement at large road-junctions, 'stop' signs at the entrance to main roads from minor roads, the direction of one-way traffic along certain streets in busy areas, and restrictions on parking are among other devices to ensure a swiftly-moving, safely controlled flow of traffic. Pedestrian crossings are a safety device introduced in many parts of Great Britain. Such crossings may be controlled by police or by light signals, but even when not so controlled a driver of a vehicle is obliged to allow free passage to a pedestrian (Pedestrian Crossing Places Regulation, 1941).

**Tragedy**, see under DRAMA.

**Trahorne, Thomas** (c. 1637–74), Eng. writer of eccles. tracts and poet, b. at Hereford. He took his B.A. degree at Brasenose College, Oxford, in 1656 and became rector of Credenhill, near Hereford. His *Centuries of Meditation*, 1655, his verses, turn upon the theme of Henry Vaughan's *The Retreat*, and are noted for penetrating mysticism. His prose is his best work. He continues Anglican mystical poetry down to the Restoration. Until the nineteenth century his work existed only in MS. His poems pub. in 1906, were ed. by Dobell (1906), and his *Poetical Works* were ed. by G. L. Wade (1932).

See life by G. L. Wade, 1945.

**Trail**, tn. of Brit. Columbia, Canada, 48 m. S.W. of Nelson on the R. Columbia. There is a fertiliser factory, and a large metallurgical plant nearby. Pop. 9400.

**Trained Bands**. Originally the élite of the General Levy of the late Middle Ages, provided by the larger tns. and better trained because they could be assembled more regularly and for longer periods. Prov. T. B. appear all to have been modelled on those of London, who owed their efficiency to the haven of the Honourable Artillery Company (*q.v.*). Only the London T. B. need seriously be considered here. In 1539 Henry VIII. reviewed the City of London militia who were all dressed in white uniforms with the arms of the city worked on them before and behind (see UNIFORM).

In 1585 the first line of the London T. B., all musketeers, to the number of 4000, were exercised separately in Mile End Fields and reviewed at Greenwich. This body was trained by the I.F.A.C. which was in reality more a guild of archers and arquebusers than a fighting unit. James I. in 1614 organised the London T. B. in companies, and in 1616 into four regiments, one each for N., W., S., and E., all under command of the Lord Mayor. This number was greatly expanded in the Civil War, and a Royalist spy's report roll of 1643 shows nine regiments of T. B. and five of auxiliaries with an average strength of 1270 and 1000 respectively. Each regiment had about 70 officers including sergeants and corporals and a varying number of companies

each containing about 175 musketeers and 120 pikemen. It was these troops who raised the siege of Gloucester and won the battles of Newbury and Worcester, besides providing a strong Parl. garrison for the capital.

In 1661 Charles II. abolished all T. B. except those of London, which continued to exist until 1794 when they were formed into the City of London Volunteers, still trained by the H.A.C. In renewing its charter William III. specifically ordered that all commissioned officers of T. B. must be members of the H.A.C.

See MS. in United Services Museum, London, 'The Ensigns of the Regiments of the Itebellious City of London . . . per opera Guilielmi Lovell, Armigeri, Sept. 26, 1643,' and C. B. Montefiore, *The Volunteer Force*, 1909.

**Training (Athletic)**, process of raising the level of mental and physical fitness as a means of preparation to take part in an athletic event. T. may be divided into two parts—(1) the attainment of general physical fitness, and (2) specific practice to perfect the technique required by the particular athletic event for which the T. is a preparation. The first is the sole object of T. in its early stages. Long walks, jog-trot, road, or cross-country running, and attention to diet, are among the means employed. Gymnastic exercises may be included and should be selected to develop the muscles required for the particular athletic event. If T. is overdone, staleness may result. The mental attitude is important. Perseverance, development of the powers of concentration and equally the ability to relax, and absence of worry are essential in successful T. After a fairly prolonged course of general T. the muscles become attuned, stamina is created, and specific T. for the event in question may then begin. Style and technique can only be perfected by regular practice. For bibliography, see **ATHLETICS**; also **PHYSICAL TRAINING**.

**Training Colleges, or Normal Schools**, institutions for instructing young teachers in the principles of their profession. The function of T. C. in the United Kingdom is really two-fold, as the colleges aim at giving a general higher education as well as imparting specific pedagogical instruction. The necessity for such institutions was recognised as early as the sixteenth century by Richard Mulcaster, an Eng. schoolmaster. Lancaster and Bell, at the beginning of the nineteenth century, employed the expedient of training teachers by the monitorial system, in which young people still under instruction helped to teach those still younger. In their efforts to establish a well-organised elementary school system Bell and Lancaster diverged on the question of religion. In 1808 the Royal Lancasterian Society, afterwards called the British and Foreign School Society, was formed with distinct Nonconformist tendencies. In 1809 Bell's followers founded the National Society for Promoting the Education of the Poor in the Principles of the Estab. Church throughout England and Wales. From

these two societies sprang a system of elementary schools and, later on, a number of T. C. The qualification for entrance to these colleges was success in passing the King's Scholarship Examination, latterly known as the Preliminary Examination for the Elementary Teacher's Certificate, or one of a number of examinations recognised as equivalent; but the denominational colleges also required something in the nature of a religious test. The test was partially abolished in 1905.

There were in England and Wales in 1949, 22 Univ. Training Colleges or Depts.; and 123 T. C., giving two or three year courses, mainly for non-graduates: of the latter, in London, 5 are co. council colleges and 22 are under other direction. In Scotland the system is different, and there are four Training Centres for men and women, at Aberdeen, Edinburgh, Glasgow and Dundee. There are also three T. C. for women: two of these, at Glasgow and Edinburgh, are for Rom. Catholics, and the third at Dunfermline is for Physical Training. In N. Ireland there are two T. C.

In the U.S.A. the course of study in T. C. or N. S. varies considerably; the qualifications for entry are not very high, and the course consists of two years' study in the science of education and methods of teaching; one year is devoted to the theory and practice of teaching. Chairs of education have been estab. at many univs., and in the larger cities City Training Schools have been formed for the training of teachers. Of these schools the best example is the Brooklyn Training School.

**Training Corps, Officers', (O.T.C.)**, formed in March 1908 to provide students in schools and univs. with a standardised measure of elementary military training in order that they might eventually become officers in the Territorial and Reserve forces. Those who obtained certificates of proficiency were exempted from a portion of the examination for officers of those forces. The Corps was in two divisions—senior, which included univ. units, and junior, consisting of public school units. The pre-1939 O.T.C. is now the Combined Cadet Force. This consists of a Junior Training Corps for public schools and an Army Cadet Force for all schools that have no Junior Training Corps, the two branches being combined in 1948 for training purposes. The present scheme provides for a common basis of training up to the standard of Certificate "A" Part I. and for the formation of specialist Navy, Army, and Air Force sections for older boys. It simplifies the administration of the various cadet units in schools and makes it easier for schools to run cadet forces for all three services instead of for only one or two of them. The Sea Cadet Force remains a separate organisation.

**Trajan (Marcus Ulpius Nerva Trajanus)** (c. A.D. 53–117), Rom. emperor, b. at Italica, near Seville. He received a rigorous military training from his father and gained further experience in the E. and in Germany, where he served with



distinction. He was in consequence made consul in 91, and at the close of 97 was adopted by the Emperor Nerva, who gave him the rank of Caesar and nominated him as his successor. In 101 T., who had succeeded to the throne in 98 on the death of Nerva, set out on his campaign against the Dacians. This occupied some three years, at the end of which Decebalus sued for peace and T. returned in triumph to Rome. Decebalus took his own life, and his chief stronghold Sarmizegethusa (now Varhely) was converted into the colony of Ulpia Trajana, T. receiving the title Dacicus. In 114 the emperor left Rome to make war on the Armenians and the Parthians, and in the course of two campaigns he conquered the greater part of the Parthian empire and took the Parthian cap. of Ctesiphon. In 116 he descended the Tigris and entered the Euphratean Sea, but in his absence the Parthians rose against the Romans, and he was forced to return. Besides his military exploits he constructed sev. great roads, built libraries (e.g. *Ulpia Bibliotheca*), and a theatre in the Campus Martius. He is said to have been the founder of the famous *limes*, or frontier fortification, which in modern times has been accurately traced, and which extended from the Tannus to Altmühl. His great work was the *Forum Trajanum*, in the centre of which was placed the Column of Trajan. Arts and sciences fl. under T., literature can show men like Tacitus, Juvenal, and the younger Pliny, with whom T. himself kept up an active correspondence. See B. W. Henderson, *Five Roman Emperors*, 1927.

**Trajectory**, see under BALLISTICS.

**Trajectus Superior**, see MAASTRICHT.

**Tralee**, co. in, and seaport of Kerry, Ireland. It trades in butter and exports grain. Pop. 10,200.

**Trammel**, see ELLIPTIC COMPASSES.

**Trammel-net**, see under FISHERIES.

**Tramore**, seaside resort of Waterford, Ireland, 8 m. S. of Waterford. Pop. 2,000.

**Tramps**, see VAGRANTS.

**Tramways**. Iron rails for use at collieries were first introduced by James Outram in 1776 at the Duke of Norfolk's colliery at Sheffield. Other works were soon carried out by Outram in many parts of the country, and the name 'Outram ways' was abbreviated to 'tramways.'

The first tramway for conveying passengers was estab. in New York in 1832 and America remained ahead of other countries both in development of an extensive network of tramlines and in the later adoption of electric power. In 1890 the U.S.A. had 2500 m. of electric tramlines, large inter-urban cars ran on special track through the country and used ordinary tramlines in the towns, and in 1905 it was possible to travel from New York to Chicago by tram, except for a few intermediate stretches. It was an Amer. who started the first horse-drawn tram in Britain, at Birkenhead, in 1858. In 1861 T. were tried in Bayswater, Kennington, and Westminster, but the rails interfered with other traffic and the experiment was

soon abandoned. Liverpool had its first tramway in 1868, estab. by private Act, and in 1869 lines were laid down in Mile End and Bow Road, Kennington-Clapham, and Vauxhall-Greenwich. Eight years after the passing of the Tramways Act of 1870, there were 237 m. of tramway lines operating in Britain and steam began to be used as driving power. In 1886 there were 779 m. of tramways employing 23,000 horses, and 439 steam locos were in use. Cable-hauling of trams was tried in Birmingham and Edinburgh (1884) and continued in the latter city for many years. Meanwhile in 1879 the Siemens firm in Berlin had demonstrated an electric tramway and this system was rapidly developed and adopted in many continental cities. By 1897 Berlin, Hamburg, Frankfurt, and Brussels had extensive electric tramway systems. The first electric tramway in the United Kingdom was the Portrush Electric Railway (1883). By 1890 Manchester trams were all electrified, but London kept its horses till 1905. By 1914 an extensive system was functioning. After 1924 many lines were pulled up and the trolley bus (see ELECTRIC TRACTION) superseded the tram on many routes.

**Technical**.—Battery-driven trams were tried in the early days, but in all modern tramway systems current is supplied to the cars through overhead lines or conductors placed in underground conduits. Ministry of Transport regulations prescribe the use of direct current at a voltage not exceeding 600 V. for tramways in Great Britain, but elsewhere alternating current is sometimes used. Grooved guide rails of steel laid on a solid concrete foundation are normally used, and the welded joint has now superseded the mechanical fish-plate joint. In the overhead system the (+) conductor is a hard-drawn copper or alloy wire suspended but insulated from steel span wires either extending across the road and attached to poles on both sides or attached to brackets carried by poles on one side of the road only. The span wires are further insulated from the poles. A collector, which may be a bow or a trolley on an arm fixed to the roof of the car conveys the current from the wire to the car motors, contact being maintained by means of spring attachment of the arm or bow to the car. The rails usually form the return (−) conductors, though sometimes double overhead conductors are used, with two collectors on each car. For various traction systems see ELECTRIC TRACTION, *Application to Tramways and Railways*.

Double-deck trams with end entrance are usual in Great Britain but elsewhere single-deck cars are widely used, often coupled with a trailer at peak-load periods. Some Amer. and continental cars have the entrance at the middle. The body is carried either on a single 4-wheel truck or on two 4-wheel bogies. The wheel base is usually 4 ft. to 4 ft. 6 in. for bogies, 6 ft. for single trucks. The motors on Brit. trams are usually 500 V d.c. series motors and each car carries 2 or sometimes

4. All cars are provided with hand brakes, the brake shoe acting on the wheel rim, and a circuit breaker, and usually rheostatic or electro-magnetic track brakes.

By the Tramways Act, 1870, any city or tn. council (*q.v.*), co. council, or company can construct Ts. provided they obtain the necessary powers under a private Act of Parliament or a Provisional

be sufficiently light to permit of the existence of some ideational activity, and the patient may exhibit some measure of discrimination in his reaction to stimuli. The more profound types may present the signs of catalepsy, with a complete absence of response to all sensory stimuli, and 'flexibilitas cerea.' In T., loss of memory for the period varies in



A. T. Kelly

Glasgow Corporation Transport

A GLASGOW TRAM: 1950

The tram has seating accommodation for 70 passengers: 30 in the lower and 40 in the upper saloon. The overall length is 34 ft. 6 in.; the width 7 ft 3 in.; and the height from the rail, 15 ft. 3 in.

Order (*q.v.*) of the Board of Trade confirmed by Parliament. A co., mun. bor., or urb. dist. council can obtain from the Light Railway Commissioners power to construct a *light railway*, i.e. a tramway worked by steam or electric power upon the public highways (Light Railways Act, 1896).

See A. T. Dover, *Electric Traction*, 1917, 1929; and J. H. Clapham, *Economic History of Modern Britain*, 1926.

**Tranarossan Bay**, see under ROSAPENNA.

**Trance** (Lat. *transire*, to cross over), is one of many popular names which have been used to describe hysterical stupor. In former times the condition was attributed to the passage of the soul out of the body of the subject and the invasion of another spirit for the time being. T. may occur spontaneously or may be induced by hypnosis. The spontaneous form may last for a week or even more, with intermissions, eventually passing into normal sleep, from which the patient can be roused in the ordinary way. In the hypnotically-induced type, the duration and intensity are controlled by the hypnotist. The depth or intensity of a spontaneous T.-state can vary within wide limits. The degree of intensity may

proportion to the intensity of the state.

**Tranent**, tn. in E. Lothian, Scotland. There are coal mines and quarries in the vicinity. Pop. 5500.

**Transbaikalia**, or **Dauria**, formerly a prov. of E. Siberia, now included in the Buryat Mongolian (see BURYAT MONGOLIA) Autonomous S.S.R.

**Transcarpathia**, Region of the Ukrainian S.S.R., consisting of the former Czechoslovak prov. of Ruthenia (*q.v.*).

**Transcaucasia**, region S. of the Caucasus Mts. The name formerly applied to the provs. and govs. of Russian Caucasia, i.e. the military dists. of the Black Sea and the govs. of Baku, Elisavetpol, Erivan, Kutais, and Tiflis (Tbilisi), together with the provs. of Batum (Batoumi), Kars, and Daghestan, but excluding the provs. of Kuban, Terek, and the gov. of Stavropol. Forming part of the Czarist Russian Empire, in 1919 it was the scene of protracted warfare between the Georgians, Armenians, Tatars, and other peoples inhabiting the area. Ultimately the three Socialist Soviet republics, Armenia, Azerbaijan, and Georgia agreed to join the U.S.S.R. and in 1922 the Transcaucasian Federation was estab. consisting of these three republics, together

with an autonomous dist. and the Batum area. In 1936 all three republics became separate constituent republics of the Soviet Union. The Georgian S.S.R. now includes also the autonomous republics of Adjara, with cap. Batumi, and Abkhazia, and the South Ossetian Autonomous Region. *See further under* ARMENIA, AZERBAIJAN, CAUCASUS; and GEORGIA.

**Transcendentalism** has both a philosophical, and a theological meaning. Philosophical T. is associated chiefly with Kant (whose use of the term differs, however, from that of previous philosophers), and his successors who defended the idea of *a priori* (or intuitive) as opposed to a *posteriori* (or experiential) cognition. In a broader sense, T. signifies the spiritual or intuitive attitude of mind. Theological T. is allied to this latter significance, and expresses the idea of a supersensuous religious consciousness, an intuitive perception of divine truth, as opposed to dogmatic rationalism. The most prominent school of theological T. began in New England (the Transcendental Club, 1836), and included Emerson, Ridley, Bronson, Alcott, Thoreau, Margaret Fuller, and others.

**Transeena**, tn. of Manitoba, Canada. 6 m. E. of Winnipeg. There is a cross-toting works and railway workshops. Pop 6100.

**Transept**, in architecture, that part of a building which lies across, or in a direction at right angles to, the main axis.

**Transfiguration, Feast of** (Aug. 6), commemorates the vision of Jesus Christ in glory accorded to the Apostles Peter, James, and John (Matt. xvii). The Feast was instituted in 1457, for the W. Church, but is sev. centuries older in the E.

**Transformer**. The T. is a device for changing the E.M.F. of an alternating current. The simplest type of T. consists of two coils wound round the same iron ring. One coil, known as the *primary* is connected to the alternating current (A.C.) supply, and the alternating current in the primary induces an alternating E.M.F. in the other coil, known as the *secondary*. The function of the iron core is to minimise magnetic leakage, i.e. to cause the lines of magnetic induction due to the primary current to thread the secondary circuit and *vice versa*. The magnitude of the E.M.F. induced in the secondary coil is controlled by the ratio of the number of turns of wire in the secondary to that in the primary; where this number is considerable, e.g. in an induction coil, an E.M.F. of several thousand volts may be induced in the secondary by connecting an accumulator in the primary circuit. Ts. are employed in radio circuits (*see* LOUD SPEAKER), in ordinary telephone circuits, and their most important application is to the transmission of electrical power to great distances. *See* ELECTRICITY AND MAGNETISM (ELECTRO-MAGNETIC INDUCTION); ELECTRIC POWER TRANSMISSION; and ELECTRIC SUPPLY.

**Transfusion**, passage of fluid from one vessel to another, especially the introduction of fluid into the blood-vessels.

Saline solutions are usually used for this purpose, but T. of blood alone provides the necessary ingredients when much blood has been lost. T. is made, in the direct method, from one person to the other without the blood being exposed to the action of the air. *See further under* BLOOD TRANSFUSION.

**Transit Circle**, *see* TRANSIT INSTRUMENT. **Transit Instrument**, an instrument for determining the moment when a star, planet, etc., crosses the meridian, for the purpose (1) of ascertaining its place fundamentally on the celestial sphere, or (2) of determining the local apparent sidereal time when the star's 'place' is known; from this apparent time the mean solar time follows if the long. is known, or the long. if the mean solar time on some standard meridian (e.g. Greenwich) is known. The instrument consists of a very rigid telescope with its optical axis closely perpendicular to a mechanical axis which terminates in a pair of heavy pivots, symmetrically placed on opposite sides of the telescope. These pivots lie in bearings as nearly as possible horizontal and E.-W., so that the telescope can be directed only to points on the meridian. In the focal plane there is a fine vertical spider-thread (called a 'wire'), which can be moved horizontally, i.e. E. and W., by a micrometer screw with a divided head. To 'observe' any star, the transit is first set to the required altitude; when the star enters the field of view, a quick final adjustment of altitude is made, and the 'wire' is then moved by the screw so that it continually bisects the star-image as exactly as possible. The movement may be by hand, or else by means of a pre-set motor with final adjustments by hand. In either case a considerable degree of practice and skill is required, and small 'personal errors' remain which must be determined for each observer. The screw-head carries a disc which makes an electrical contact at certain definite readings, and these contacts are recorded on a chronograph against contacts from the standard clock. The clock-times at which the star's image was at certain specified distances from the central point are thus available by interpolation, and hence the clock time at which it passed that point. If the line of pivots is exactly horizontal and E.-W. this is the time of transit, but in practice these conditions are not satisfied; the 'level' and 'azimuth' must be directly determined. The central point, i.e. the micrometer reading at 'collimation,' must also be determined; the reading is that for which the 'wire' is so placed that a line joining it to the centre of the lens is perpendicular to the pivot-axis. The pivot-axis itself is not a fixed line, since the pivots are not perfect, and no method of determining collimation has in fact any validity apart from a determination of the pivot-errors, which should preferably be small compared with a wavelength of light. Their proper determination is laborious, and the effect on them of wear is often neglected more than is really safe. With small instruments

such as are mainly used in time and longitudinal work, it is usual to reverse the transit in its bearings in the middle of each observation; this eliminates the collimation, but not the antisymmetrical part of the pivot-errors.

**Transit-circle** (or meridian circle): a transit equipped to determine also the altitude (and hence the declination) of the star at transit. A large divided circle is attached to the transit and read by four or six fixed microscopes with micrometer eyepieces, and there is a second moving spider-thread, with its micrometer screw, in the focal plane of the telescope, at right angles to the first. The micrometer reading for bisection by this wire is usually taken before and after meridian passage. It has to be combined with the circle readings. The division-errors of the circle must be determined; this is also a laborious process, but in a good instrument they should never change.

**Broken transit.** Some small reversible transits have the optic axis turned through a right angle, by reflection at a 45° mirror, so that the light comes out through one of the pivots, made hollow for the purpose; the eyepiece is then in a fixed position on the end of the pivot.

The method of transit-observation was started in principle before actual transit instruments had been invented; the first Greenwich transit was erected by Halley in 1721, and the first transit-circle by Airy in 1850; this instrument still defines the Greenwich meridian.

**Transjordan**, *ter.* roughly corresponding to the area of the medieval Seljuk kingdom of Kerak and of Oultrejordain in the Lat. kingdom of Jerusalem, is now (together with the Arab parts of Palestine, *q.v.*) an independent Arab kingdom, the 'Hashemite Kingdom of Jordan.' T. is bounded on the W. by Israel, on the N. by Syria and the Jebel Druze (Jebel Druze), on the N.E. by Iraq, and on the E. and S. by Saudi Arabia. Before the annexation of parts of Palestine (*c.* 2000 sq. m.) in 1950 (*see below*), T. had an area of approximately 90,000 sq. kilometres or 34,740 sq. m.

**Physical Geography.**—The N. part of the kingdom is elevated country, rising to about 4500 ft. above sea-level, which, on its W. side, declines sharply to the narrow fertile plain of the Jordan valley and, on its E., slopes more gradually to grasslands traversed by the Hejaz railways and eventually becomes merged in the desert. This grassland strip forms the summer pastures of Bedouin tribes who in winter move E. for pasturage. The wheat and barley lands of the Kerak and Balqa tribes, of the Circassian colonies, and of Arab villagers lie W. of the Hejaz railway. Generally speaking, the country to the E. of this railway is largely desert, but to the W. of this line, it is potentially of high agric. value. The deep lateral valleys yield water for irrigation of valley lands and of considerable land areas of the Jordan depression which later are cultivated by semi-nomad tribes or used as winter grazing ground.

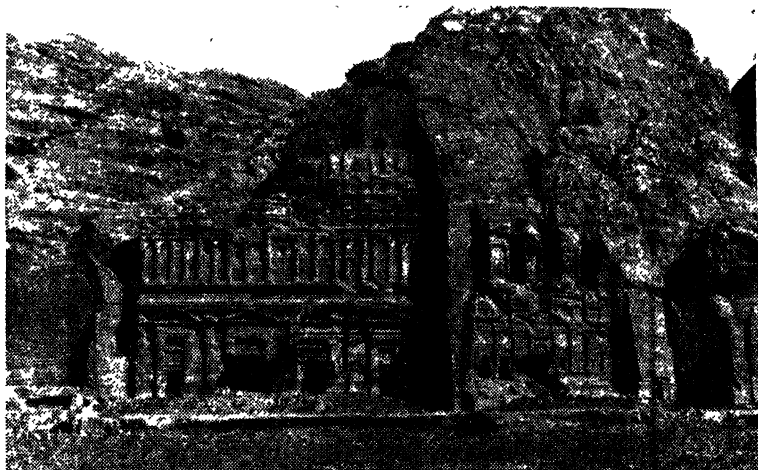
Cereals are grown, vines flourish, and some of the anct. forests of Gilead survive; but of the whole area of T. only a very small part receives enough rain to render cultivation possible. T. consists of the five dists. of Maan, Amman, Kerak, Balqa, and Ajlun, and the Desert Area. There are many large vills. in the N., but the only tns. of any size are Amman (the cap.), Salt, and Kerak. There are phosphate deposits; potash is found in the Dead Sea, and possibly there is oil in the S. area. The road running from Amman to Maan has been continued to Aqaba (Akabah), and from this main road, branches run to Madaba, Kerak, Rafiah, Petān, and other tns. A metalled road, fit for motor traffic, connects Amman with Jerusalem.

**Population.**—There has been no official census in T., but in 1938 (the last year an official report was issued) the pop. was estimated at 300,000; of these 260,000 were Arab Muslims, 30,000 were Arab Christians, and 10,000 were Caucasian elements (chiefly Circassian) settled by the Turks over sixty years ago following the Turco-Russian war. There are also small minorities of Turcomans, Persian Bahā'is, and Shushans. The annexation of parts of Arab Palestine in 1950 approximately doubled the pop. According to the organic law of 1928, Arabic is the official language (Art. 15), and Islam the State religion (Art. 10). The people of T. are divided into the following groups: (1) the mhab. of the tns.; (2) the settled agric. pop. concentrated on the slope of tableland situated on the edge of the Jordan valley and of the Dead Sea, and measuring 200 m. from N. to S. and some 25 m. in average from W. to E.; (3) the semi-nomads living in tents but cultivating the soil; and (4) the Bedouin, or Nomads, who are dependent on their flocks; the nomadic tribes are subdivided (according to the Electoral Law of 1928) into 'the people of the N.' (the Beni Sukhr, Sirhan, Beni Khahd, Issa, and Sleit), and 'the people of the S.' (Howlāt, Mana'in, Hajaya, and others). There are constant seasonal migrations on the part of the Bedouin from T. into Palestine, and from Arabia into T., and back again. Land settlement is important, for the pop. is increasing with remarkable rapidity. Much *mashaa* (common) land has been divided, and a Dept. of Development and Hydrographic Survey has been estab. The outlay on social services and public works has increased steadily. But the rapid westernisation which has changed Palestine beyond recognition has not reached T., where progress has followed a much more leisurely pace. The defence of T. is the Arab Legion, commanded by Lt.-Gen. J. B. Glubb (*q.v.*).

**The Formation of the Kingdom of Jordan.**—Under Turkish rule, T. was part of the vilayet of Damascus. After the First World War, the Supreme Council of Allied Powers at San Remo on Apr. 25, 1920, allocated a mandate for Palestine (*q.v.*), including T., to Great Britain. This was later confirmed by the Council of the League of Nations on July 24,

1924. In April, 1923, the Brit. Gov. recognised the existence of an independent gov. in T. under the rule of Amir (now King) Abdullah (*q.v.*), and on Feb. 20, 1928, an Agreement between His Britannic Majesty and the Emir (Amir) of T. was signed in Jerusalem, and having been accepted by the Legislative Assembly (set up under Art. 11) was ratified on Oct. 31, 1929. In 1934 the Agreement was amended, and in 1938 the Organic Law was amended. On May 16, 1936, Great Britain agreed to the formation in T. of a Council of Ministers, responsible to the Emir, in place of the existing Executive Council. In Feb. 1946 the Emir visited the United Kingdom, and a treaty of alliance for twenty-five years was signed

is the coastal dist. of Gaza which is controlled by Egypt. As to Jerusalem, while, as mentioned, the Old City and the E. part has been annexed by Jordan, and the New City has been proclaimed as the cap. of Israel (which is in full control of it), the United Nations Trusteeship Council, on the basis of the resolution approved by the U.N. General Assembly, adopted (April 4, 1950) the U.N. Statute of 1948 to internationalise Jerusalem and its environs, an area of c. 100 sq. m. The statute places the 'City of Jerusalem' under a permanent international regime, as a *corpus separatum*, to be administered by the Trusteeship Council. The ter. of the 'City of Jerusalem' also includes Bethlehem.



E.N.A.

TRANSJORDAN: THE TOMB OF THE THREE STOREYS AT PETRA

on Mar. 22, 1946; the United Kingdom recognised T. as an independent state with the Emir Abdullah as sovereign. On Apr. 25, 1946, the Emir was proclaimed king of T. in a ceremony at Amman, and on June 12, 1946, the Foreign Office announced the appointment of an Envoy Extraordinary and Minister Plenipotentiary to T. On March 15, 1948, a new Anglo-T. treaty of alliance was signed in Amman. In June 1949 the name of T. was changed to 'The Hashimite Kingdom of the Jordan' and the annexed Arab Palestine forms an integral part of it.

King Abdullah officially announced on April 24th, 1950, that he had annexed to his kingdom those parts of Palestine occupied by his forces. The annexed part includes the dists. of Jenin, Tulkarm, Nablus, Ramallah, Jericho, the Old City and E. part of Jerusalem, Bethlehem, and Hebron; on the whole, c. 2000 sq. m. The only pure Arab part of Palestine which has not been annexed by Jordan

*Prehistoric and Ancient History.*—T. is rich in anct. remains. There are prehistoric rock-drawings, including representations of the ox and the ibex, which probably come from the Middle Stone Age, and also menhirs and dolmens, which probably date from the Late Stone Age (up to c. 5000 B.C.). Extremely interesting is the Chalcolithic culture (fifth and fourth millennia B.C.), known as the Ghassulian. It takes its name from the site of its first discovery, Teleilat el-Ghassul, just N. of the Dead Sea; it was excavated by the Jesuit fathers from 1929 to 1938. The pottery was much improved in technique and varied in form, painted designs being common. The walls of the houses were adorned with amazing fresco paintings, which reached a higher pitch of achievement than the art of Palestine, Syria, and Mesopotamia did for thousands of years thereafter. An important civilisation flourished between the twenty-third and twentieth centuries B.C. along the N.-S. track

through central T., but c. 1900 B.C. the formerly flourishing settlements and fortresses fell into disuse; presumably it was around this period that the catastrophic destruction of Sodom and Gomorrah (Gen. xix. 24-28) took place. Not until the beginning of the thirteenth century B.C. did a new agric. civilisation appear belonging to the Edomites, Moabites, Ammonites, and Amozites. From the sixth to the second century B.C., there was little or no settlement, and mainly nomadic occupation, but the first century B.C. and the first century A.D. witnessed the flourishing Nabatean culture (see under NABATÆI), which is exemplified in the abandoned cap. of Petra, one of the most remarkable cities of the anc. world. Also the Decapolis (q.v.) fl. in this period. It is mentioned on three occasions in the Gospels. Except Scythopolis (see under BLISAN), all of the tns. of the Decapolis lay to the E. of the Jordan. Gadara is identified with the ruins of Umm Qeis, some 5 m. S.E. of the Sea of Galilee. Gerasa (q.v.) known to-day as Jerash, lay on one of the tributaries of the Jabbok. Excavations conducted by Yale Univ., Brit. School of Archaeology in Jerusalem, and the Amer. Schools of Oriental Research, in 1925-31 and 1933-34, have revealed that in the early centuries A.D. Gerasa was one of the most brilliant cities of T. Pella (Fahl), midway between Gadara and Gerasa, was the city to which the Christians fled from Jerusalem in A.D. 63 and again in A.D. 135. Philadelphia (it was formerly known as 'Amman,' having been the chief city of the Ammonites, and it is now called 'Amman,' the cap. of T.), the Iabbah of the O.T., was re-built by Ptolemy II. Philadelphus and named for him; extensive Roman ruins are still to be seen of this southernmost of the cities of the Decapolis. Christian bishops of Pella are mentioned as late as the fifth and sixth century A.D., and a number of early Christian churches (of the fourth to the early seventh century) have been investigated in Gerasa (which was shattered by earthquakes in the eighth century, and left deserted for most of the next 1000 years), but generally speaking T. was already apart from the main streams in which the hist. of the future, till modern times, was to flow. A systematic archaeological survey of T. was carried out, in the years 1933-43 by the Amer. scholar Nelson Glueck, who also discovered (in three short campaigns, 1937-40) at Tell el-Kheleifeh (anc. Ezion Geber) on the gulf of Akabah, remains of copper refineries going back to the tenth century B.C. and the reign of King Solomon.

See F. G. Peake, *A History of Transjordan and its Tribes*, 1934; A. Konikoff, *Transjordan: an Economic Survey*, 1946; J. B. Glubb, *The Story of the Arab Legion*, 1948; and King Abdullah, *Memoirs*, 1950. See also bibliography under PALESTINE.

**Transkei Territory**, productive region of S. Africa, principally in Cape Prov. It is mainly native ter. although it has some fairly important tns. The chief manuf. is cotton.

**Translation**, in literature, is the art of rendering the writings of one language into another language. The art of translating lies not merely in translating the literal sense of one language into another, but of translating also the feeling, thought, and character of the work, so that the finished T. is equal in quality to the original. In Fitzgerald's T. of the *Quatrains* of Omar Khayyām, the Persian astronomer and poet, the T. is not the minister, but the equal and even the superior of its original. See J. P. Postgate, *Translation and Translations*, 1922.

**Transmigration, Metempsychosis**, or **Reincarnation**, the migration of the soul, as an immortal essence, into successive bodily forms, either human or animal. See further under REINCARNATION, OR METEMPSYCHOSIS; BUDDHA and BUDDHISM.

**Transmission**, see GEARING.

**Transmission, Electric**, see ELECTRIC POWER TRANSMISSION.

**Transmitter**. Any piece of apparatus from which intelligence is sent out by mechanical means, by telephone or telegraph line or, more especially, by radio. A radio T. generates radio frequency waves (see RADIO) having a desired frequency; it amplifies these up to the power level required for transmission, impresses upon them the intelligence to be conveyed (see MODULATION) and finally feeds them to an aerial (q.v.) which sends them into space, subsequently to be intercepted at the receiver (q.v.).

The first stage in a T. is the oscillator which consists of a valve (q.v.) which generates radio frequency oscillations whose frequency may be controlled by the value of the components associated with it or by a quartz crystal (q.v.). The frequency so produced may not be as high as required although it must always bear some simple mathematical relation to the final carrier frequency. In such a case one or more frequency multiplier stages follow the oscillator and double, treble, etc., the oscillator frequency to the required value. After this follow amplifier or 'buffer' valves which bring the level up to that required to drive the output valves which in turn handle the power delivered to the aerial. If this power is high (sev. hundred kilowatts in the case of the larger broadcasting stations) the final amplifier valves are very large and are usually operated in pairs as push-pull (see VALVES) amplifiers with sev. pairs operated in phase to give the required power output. It can be appreciated that, despite the fairly high efficiency obtainable in a Class C amplifier there is a large quantity of heat produced which must be abstracted if overheating is to be prevented. For this reason it is the practice to provide water or air-blast cooling of valve anodes in high power Ts.

Low power Ts. for portable, mobile, and fixed stations use powers which range from fractions of a watt to a few hundred watts according to the service, and modern Ts. in this category have become exceedingly compact and light. Notable among these are some of the equip-

ments used by the armed forces for such applications as paratroop communications, etc., where a complete T.-receiver (or 'transceiver' as it is called) can be carried amongst the multiplicity of other equipment with which the paratrooper is dropped. These small sets are powered from dry batteries and have a range of a mile or two according to the local terrain. Larger units for vehicle use have correspondingly greater ranges and are powered either by accumulators driving rotary transformers or by petrol-electric generators carried with them.

Special Ts. operating in the very high frequency (V.H.F.) bands are coming into increasing use for mobile communications work with police forces, fire services, taxi companies, etc. (see RADIO). They are, as a rule, crystal controlled, and the portable versions operate at powers of the order of ten watts. Fixed V.H.F. Ts. are usually of lower power than their lower frequency counterparts since the aerial directivity can be made much greater with consequent saving of T. rating.

Ts. for radar (q.v.) and television (q.v.) have special features. The former type are designed to be capable of producing pulses of one microsecond or less duration having exceedingly high peak power (up to one megawatt). As these pulses are of such short duration and their repetition frequency is relatively low, the average power is not great. The valves, therefore, have large cathodes capable of meeting the peak emission requirements, but the anodes are designed to deal with the average power dissipation. Television Ts. must possess wideband characteristics if the full picture detail is to be radiated without distortion. The modern tendency is to design such Ts. to transmit the carrier and only one sideband as this leads to maximum economy of frequencies and power rating of the final amplifier. The system is known as 'vestigial sideband' transmission.

**Transmutation of the Elements**, belief that it may be possible to convert one element into another. This, a very old belief, formed one of the central ideas of the alchemists who were searching (among other things) for the philosopher's stone which would be the agent for the turning of base metals into gold (see ALCHEMY for a hist. of the early ideas). The facts that iron when placed in a solution of blue vitriol appeared to be converted into copper and that a new substance resembling gold (really an alloy) could be made from copper and arsenic appeared to confirm such possibilities. Naturally their methods were immature, and the distinction between transmutation and replacement was not appreciated. Various alchemists claimed to have discovered the means of converting base metals into gold. With the discovery of radium and radioactive substances in general a new era opened. Ramsay and Soddy found that radium bromide, by spontaneous change, gave rise to radon (a gas), and by spectroscopic examination helium gas was shown to be a product of the change. Now it is quite certain that

radium itself is an element, so that here there appears to be a definite example of one element splitting up to give rise to entirely different elements. This disintegration has been shown to be a characteristic property of radioactive bodies. When an atom loses one alpha-particle (a charged helium atom) its atomic weight decreases by 4 and its atomic number decreases by 2. On the other hand, when an atom loses a beta-particle its atomic weight remains unaltered, but its atomic number increases by one. In either case it will be noted that a new element is the product of the change (see RADIOACTIVITY). Radioactive series of particular interest in this connection are (1) the Uranium series: in this series the end product of disintegration is lead; (2) the Thorium series: here again the end product of the disintegration is lead. In both series the predominant change is the one involving the loss of an alpha-particle, and thus by degradation member after member of the series is obtained where there is a difference in atomic weight of 4 between successive elements, finally culminating in lead. Lead itself is not radioactive, and the change cannot go on further. These spontaneous changes therefore do call to mind vividly the ideal of the auct. alchemists. Since a large number of elements show radioactivity (some of them to a minute extent), we are faced with endless possibilities. Many of the possibilities have indeed already been realised, and the artificial fission of atoms has been accomplished (see ATOM). Moreover, entirely new elements, previously non-existent, have been built up by applying modern knowledge of atomic structure.

**Transom**, in architecture, a term applied to horizontal wood or metal bars or divisions of windows or doors. They rarely occur before the fifteenth century and are sometimes embattled, as at Brasenose College, Oxford.

**Transonic Speeds**, see under SUPERSONIC SPEEDS.

**Transpadane Republic**, see CISPINE REPUBLIC.

**Transpiration**, elimination of water vapour from the surface of plants. In flowering plants the vapour escapes mainly from the stomata, openings on the leaves, and, in fewer numbers, on the stem, and is regulated by two bean-shaped guard cells. Stomata are usually more numerous on the lower surface of dorsiventral leaves, and are larger in light than in darkness. Consequently T. is accelerated by light, as well as by moving air, by warmth, and by dry air. The opening of the stomata in sunlight is associated with the fact that the metabolism, and particularly the anabolic processes, is then most active; it has been estimated that the chemical changes occurring within the plant in bright sunlight might produce a rise of temp. of 12° C. per min., and death would soon ensue. T., however, is accompanied by a fall in temp., and permits life and metabolism to be maintained. In addition to the function of regulation of temp., T. is a means of pro-

moting the ascent of sap in the plant and the influx of solutions of mineral salts from the soil. Excessive T. is responsible for wilting, and garden plants are best watered in the evening so that through the hours of darkness they may make good the water lost during daylight. When T. is taking place very freely liquid water may be exuded through the cell-walls, particularly at the tips of pointed leaves; this is called *guttation*. Plants (*xerophytes*) growing in dry situations, the plants (*halophytes*) of salt marshes, as also those of moors and bogs, which were formerly thought to live in conditions of 'physiological drought,' have been shown by the experiments of Delf, Maximov, and others to transpire more rapidly than *mesophytes* of less extreme conditions, despite certain xeromorphic features such as sunken stomata and thick cuticles which would be expected to reduce T. The capacity of such xerophytes to withstand drought must lie in some property of their protoplasm to endure desiccation, and is not connected with their rate of T. See H. H. Dixon, *Transpiration and the Ascent of Sap in Plants*, 1914; E. C. Barton Wright, *Recent Advances in Plant Physiology* (2nd ed.), 1933; N. A. Maximov, *The Plant in Relation to Water*, 1929; and E. C. Miller, *Plant Physiology*, 1939.

**Transplanting.** Removing seedlings and other plants and trees from one situation to another is found to improve the progress of many plants and specially those of the cabbage tribe, the point of the tap root being broken and a mass of fibrous roots caused to form. In T. shrubs and trees the fibrous roots should be disturbed as little as possible, and precautions taken against the air drying them. Replanting should be at the same depth and the roots should be well spread out in the hole prepared for them. Deciduous shrubs and trees are best moved between Oct. and March, while April is the best month for moving evergreens.

**Transport.** For land T., see CARRIER, COMMON; ELECTRIC TRACTION; MOTOR CAR; MOTOR TRANSPORT, COMMERCIAL; RAILWAYS; TRAMWAYS; For sea see CANAL; DOCKS; LIGHTER AND LIGHTER-MEN; LLOYD'S REGISTER OF BRITISH AND FOREIGN SHIPPING; SHIPPING ROUTES; SHIPS AND SHIPBUILDING; for air T., see AIRMAIL; AIRWAYS, BRITISH; AVIATION; IMPERIAL AIR ROUTES. See also TRANSPORT ACT, 1947.

**Transport Act, 1947.** Passed in Jan. 1947 to provide in Great Britain a publicly owned system of inland transport including port facilities, but excluding transport by air. It provided for the estab. of the Brit. Transport Commission, a body corporate, and statutory corporation, consisting of a chairman and four full-time and one part-time members. The Commission makes decisions on all matters of policy, which must have the consent of the minister of transport. It may raise up to £25,000,000 by temporary loans, with the minister's consent, and up to £250,000,000 by the issue of Brit.

Transport Stock subject to the approval of the Treasury. There is a general duty laid upon the Commission to provide an efficient, adequate, economical, and properly integrated system of inland transport and port facilities within Great Britain. The actual administration of the Act is delegated to six executives: The Railway, the Docks and Inland Waterways, the Road Haulage, the Road Passenger, the London Transport, and the Hotel Executives. The bodies are appointed by the minister in consultation with the Commission, and each consists of a chairman and between four and eight members. As agents of the Commission their functions are delegated to them from time to time by a scheme made by the Commission with the approval of the minister.

**Nationalisation of Railways.**—All the railway and most of the canal undertakings, but excluding the Manchester Ship Canal, that were controlled by the minister in 1939 (under powers conferred by Defence Regulation 69) remained under control until Jan. 1, 1948, when they were automatically vested in the Commission.

**Goods and Road Transport Undertakings.**—Nationalisation of goods road transport undertakings is effected by the Commission serving a note of acquisition in writing on the person carrying on the undertaking. They are bound to send a notice to any undertaking that used vehicles under 'A' or 'B' licences, and whose activities consisted 'to a predominant extent of ordinary long distance carriage for hire or reward.'

**Passenger Road Transport Services.**—These may be controlled in the future by the formation of 'Passenger Road Transport Schemes,' and the Commission will review all passenger road services in Great Britain to decide the areas to which such schemes should be preferred.

**Harbours.**—The Commission may submit a scheme to the minister with regard to 'trade harbours' with a view to securing their efficient development and management.

**Tribunals.**—The Act creates two new tribunals: the Transport Tribunal, whose jurisdiction includes that of the former Railway Rates Tribunal, the review of charges schemes and appeals against licensing authorities, and the Transport Arbitration Tribunal, which is a court of record with sole jurisdiction in all matters of compensation, etc.

See also CANAL; CARRIER, COMMON; LONDON PASSENGER TRANSPORT BOARD; PUBLIC SERVICE VEHICLE; and RAILWAYS.

**Transport Aircraft,** see under AEROPLANE; AVIATION; GLIDER.

**Transport and General Workers, National Union of,** see under TRADE UNIONS.

**Transport, Military,** process of carrying supplies for a military expedition. The armies of the Middle Ages invariably lived on the country in which they were campaigning, with the result that the inhab. were quickly rendered destitute of food



and the army itself became ineffective through the impoverishment of the country. In modern armies a specialised branch of the military organisation is devoted to questions of T. and supply, and the Brit. Army, through the necessity for colonial and punitive expeditions, possesses a particularly well-developed T. service. Road T. is worked by the Royal Army Service Corps. The supply of field units is divided into two echelons. 'A' echelon carries ammunition, tools, and ambulance supplies, and in immediate contact with the fighting troops; 'B' echelon carries camp supplies with a reserve of ammunition, tools, medical supplies, etc. Airborne supplies played a large part in the success of the Allied defence and recovery of Burma in the Second World War.

**Transport, Ministry of.** Prior to Oct. 1939 the duties now performed by the M. of T. were exercised by two depts.—the M. of T. (which was estab. by the Ministry of Transport Act, 1919, 'for the purpose of improving the means of, and the facilities for, locomotion and transport'), and the Mercantile Marine Dept. of the Board of Trade. In Oct. 1939 the Mercantile Marine Dept. left the Board of Trade and became the Ministry of Shipping. On May 9, 1941, all the functions of the minister of transport and of the minister of shipping were transferred to the minister of war transport. On April 1, 1946, the minister of war transport, retaining all his previous functions, became the minister of transport. The powers and duties of the minister of transport relate to railways, tramways; canals, waterways, and inland navigation; roads, bridges, and ferries, and vehicles and traffic thereon; harbours, docks, piers, and conservancy; and those previously exercised by the Board of Trade in relation to national and international shipping policy, to ships, their masters and seamen, safety of life at sea, navigation (including pilotage, lighthouses and other aids to safety in navigation), and wreck and salvage; coastguard; and boiler explosions, wherever occurring.

**Transportation.** According to Stephen the earliest instances of T. as a punishment in England probably occurred in the reign of Charles II., when pardons were granted to persons under sentence of death conditionally on their being transported for a number of years, usually seven. T. was unknown to the common law (*q.v.*), and it was not legalised until an Act of 1719. During the eighteenth and early part of the nineteenth century, numerous Acts were passed by which various terms of T. with alternative terms of imprisonment, and, in some cases, whipping either as an alternative or cumulative punishment, were allotted to specific offences. In 1783 convicts were first transported to Botany Bay, Australia, but this ceased in 1840 and from then until 1853 they were sent to Tasmania, which already had penal settlements. T. was gradually abolished between 1853 and 1864, principally because the colonies objected to receive the con-

victs; penal servitude or imprisonment with or without hard labour being substituted. In Russia, before the October Revolution, T. was a common practice, prisoners being sent to Siberia, especially to the silver mines of Nerchinsk. Many of these prisoners were transported for purely political offences. A similar system still prevails. The system was until recently, still practised in France and other countries.

**Transporter Bridge,** see under BRIDGE.

**Transport Tribunal,** see under TRANSPORT ACT, 1947.

**Transposing Instruments.** Many wind instruments are built in fundamental tunings in which the major scale without key signature, written as C major, actually sounds higher or lower. A clarinet in B $\flat$ , for example, will automatically play the scale of that key when the music is written in C major; or, conversely stated, if it is to play a piece in F major, the music must be written in G major, and so on. A horn in F will transpose a fifth down, a trumpet in F a fourth up, and both will play, for example, in E $\flat$  if their music is written in B $\flat$ , but the former an octave lower than the latter. Among the most common orchestral instruments, Eng. horns, clarinets, horns, and trumpets are T.I.; flutes, oboes, bassoons, and trombones are not.

**Transposition.** The process, either in composing or performing, of turning a piece or passage from one key into another in such a way that the music remains exactly the same except for the change in pitch. All melodic and chordal intervals thus remain of the same size, whatever the new key may be, so that a Sequence, which merely shifts a passage up or down in the same key and thus changes its intervals, does not amount to T., whereas a *Rosalie* does. The difficulties of T., both in writing and in playing, are somewhat mitigated by the mathematical fact that, owing to the change in key signature, all Accidentals arising incidentally in the course of the music (*i.e.* not contained in the key signature) still remain accidentals. In a piece transposed from E major up to F major, for example, an incidental A $\sharp$  will become B $\natural$ , and incidental F $\sharp$  will be G $\natural$ , and so on. Accompanists are often required to transpose at sight when a song is too high or low for a singer's voice, and occasionally the instrumental parts of a whole orchestra have to be transposed in the same way for similar reasons. A special kind of double T. is sometimes made by horn players when they wish to play on the usual horn in F a part written for a horn in some other tuning.

**Trans-Siberian Railway,** originally a single-track, but now double, and along the narrow belt of wooded steppe to which early colonisation was limited. The single track was completed in 1904 and the line links Moscow, Kazan, Sverdlovsk, and other cities of European Russia with the chief cities and towns of Siberia, including Omsk, Tomsk (by a branch line), Krasnoyarsk, Novosibirsk, Irkutsk, Khamar-daban, Chita, Blagoveshchensk (by a branch line), Khabarovsk, and Vlad-

voetok, the terminus on the Pacific coast. The total length is over 3000 m. The most important industrial settlement on the route is Irkutsk. It is at this point that the railway passes around the S. end of Lake Baikal and is joined by a road which extends northward to the Upper Lena Valley and navigation to the Lena goldfields. Since the railway passes through that part of Siberia where the Five Year Plans of the Soviet Gov. were given more opportunity than anywhere else it now passes through great trns., such as Novosibirsk, which two decades ago did not exist. Along the route of the railway there are six big industrial dists., some of them larger in area than the whole of England. One of them is the Kuzbas Basin, one of the richest regions in natural resources in the world (see KUZNETSK). Across the N. of the Buryat Mongolian A.S.S.R. runs the N. line of the T.-S. R. (the Baikal-Amur line). In 1938 a new railway was built between Ulan Ude and Khatka, on the Mongolian frontier.

**Transubstantiation** (Lat. *transubstantiatio*, change of substance), the change which is believed by Rom. Catholics to take place in the Eucharistic elements of bread and wine, in virtue of the consecration, viz.: the whole substance of the bread and the whole substance of the wine is changed into the Body and Blood of Christ, the accidents alone remaining. By 'accidents' is meant those qualities or conditions which produce upon the senses the impression of the presence of bread and wine.

**Transvaal**, original prov. of the Union of S. Africa, lies immediately N. of the Orange Free State and Natal and S. of S. Rhodesia, bounded E. by Portuguese E. Africa and Swaziland, and W. by Cape Prov. and the Bechuanaland Protectorate. The Limpopo or Crocodile R. flows along its N. frontier, and the Vaal R. marks its S. border. The area of the prov., which is divided into forty-five dists., is 110,450 sq. m. In 1903 about 7000 sq. m., including the dists. of Wakkerstroom, Utrecht, and Vryheid, were annexed to Natal. The pop. (census 1936) was 3,341,470 (European, 820,756; non-European, 2,520,714). According to the census in 1946 the pop. had increased to 4,183,779 (European, 1,041,835; non-European, 3,141,944). The surface has an average elevation of 4000 ft. A plateau, called the High Veld or Hooge Veld, extends across the prov., broken here and there by low mts. and detached heights. The chief mts. are the Witwatersrand, lying between Pretoria and Johannesburg on the E. and Mafeking on the W.; the Lydenburg and Barberton Mts. in the dist. of Barberton; the Sand River Mts. in the dist. of Waterburg; and the Murchison and Zoutpansberg ranges in the Zoutpansberg dist. The land slopes in wide plains in three directions: N. to Limpopo, S. to the Vaal, and E. to the sea. The High Veld forms the watershed between the basin of the Limpopo and the basin of the Vaal, their numerous tribs. including the Olfants R., the Ingalele, the Sand R., the

Marico, and numerous other streams, flowing N. and S. from the Witwatersrand. The rivs. in the S.E. of the prov. flow towards Delagoa Bay. The largest lake is Lake Chrissie, N.E. of Ermelo, S. of the Witwatersrand range, which forms the N. limit of the High Veld area. The climate may be regarded as not only uniformly healthy, but as perhaps the most delectable in the world. Even in summer the heat is rarely oppressive and the nights are cool; a rainfall of about 30 in. occurs generally in short and sometimes violent thunderstorms. The Berg winds, at times so oppressive on the coast, are unknown. In the winter, night frosts are frequent and winds are cold. Every few years a snowfall occurs, occasionally to a depth of sev. in. The chief industry is gold-mining, extensive mines being in operation near Johannesburg, Witwatersrand, and Barberton. The output of gold has risen steadily from about 2,000,000 fine oz. at the beginning of the century to over 12,000,000 fine oz. in 1945 with a value of over £105,000,000, and 11,704,994 fine oz. valued at £114,864,384 in 1949. Over 95 per cent comes from the Witwatersrand.

The output of diamonds has fluctuated. The peak year since 1883 was 1910, the output for which was 2,090,068 carats with a value of £1,416,464. Ten years later the output had gone down to 905,297 carats with a value of over £3,000,000, and in 1930 an increased output had a value of only £2,000,000. Since 1930 there was a decline and a number of mines stopped operations. In 1939 an output of only 85,000 carats had a value of £192,000. During the war years there was a further decline, and washing operations ceased altogether. In 1949, however, diamond production was 298,165 carats, valued at £826,483. The biggest diamond production comes from De Beers of Kimberley in Cape Prov. (in 1950, diamond production in the Orange Free State at Faresmith and Jagersfontein was resumed.) The largest diamond mine in the T. is the Premier Mine, 25 m. E. of Pretoria; it yields the great bulk of the T. mine stones. The prin. sources of alluvial diamonds are in and near the bed of the Vaal R., in the S.W. T. It was on Jan. 16, 1905, that the 'Cullinan', the largest white diamond, was found; its weight was 3024 carats (1½ lb.). Coal has become important, the value of production in 1949 being over 19,000,000 tons, valued at over £6,300,000. The output of copper ore averaged at 13,000 tons in the ten years 1930-40 with a value of £1,206,700 in 1949. Other minerals are tin, chromium, manganese, nickel; platinum was discovered in 1923.

In addition to the export of minerals, there are large exports of horses, mules, tobacco, coal, wool, clothing, jewellery, skins, hides, horns, machinery, hardware, and coaches. The T. has iron and brass foundries and engineering works, grain mills, printing works, tobacco factories, brick and tile and pottery works, breweries, coach and wagon works, soap and candle factories. Agriculture is also

a prominent industry and continues to grow in importance. The production of wheat on European farms for 1949 was 433,869 300 lb. bags; but the larger crop is maize, the annual production on European farms for 1949 being 10,388,190 200-lb. bags. Stock raising is the most important agric. occupation; the veld supports large numbers of cattle, horses, sheep, and pigs (the live stock in 1949 numbered close upon 4,000,000 cattle, 3,000,000 sheep, 1000 goats, 300,000 pigs). The ann. expenditure of the prov. is within the normal revenue (£49,177,113 for 1949).

There are in the T. 761 primary and secondary public schools and 52 high schools for Europeans, with over 184,500 pupils; 1,269 state and state-aided schools for coloured, native, and Indian children, with nearly 320,000 pupils; and 4 training institutions for European teachers, and 12 for coloured teachers. No doctrine or dogma peculiar to any religious denomination or sect may be taught in these schools. The Dutch churches take first place, being followed by the Anglican, Presbyterian, Methodist, Rom. Catholic, Apostolic Faith Mission, Lutheran. The cap. of the T. is Pretoria, which is also the administrative cap. of the Union of S. Africa (white pop. 124,500, census 1946) but the largest in. is Johannesburg, with a white pop., city and suburbs, 330,100 (census 1946). Johannesburg is 5740 ft. above sea-level and is built close to the summit of the Witwatersrand. Other large tns. are Germiston, Brakpan, Springs, Benoni, Krugersdorp, Roodepoort, Boksburg, Potchefstroom, and Vereeniging. The T. is represented by sixty-four members in the House of Assembly of the Union. In addition, there is a Prov. Council of sixty-four elected members.

**History.**—The T. was practically unknown before the advent of the Boers, who trekked from Cape Colony in 1836–37, first came into collision with the Matabele in the vicinity of Kroonstad in the Orange Free State, and finally drove them from N. of the Vaal, which they crossed themselves in 1836. Under the command of Hendrik Potgieter, they drove the Zulu warriors of Moselekatse, the revolted general of Chaka (successor of Dingiswayo, chief of the Ababwetwa, and leader of a confederation of warriors of Zululand), across the Limpopo. After the overthrow of Dingaan, the successor of Chaka, by Pretorius, the independence of the republic was acknowledged by Britain at the Sand R. Convention of 1852, and Marthinus Wessels was elected president three years later. The Boers were constantly at war with the natives, especially on the N. and E. borders, and in 1876 a commando was sent to attack Sekukuni, a native chief living S. of the Olifants R., which, however, was defeated. This reverse caused the Transvaalers to appeal to Britain for help. In consequence of their financial difficulties and troubles with the natives, the country was annexed by Britain in 1877 by Sir Theophilus Shepstone. Three years later the Boers

took up arms for the restoration of their independence, and after the fall of Colley at Majuba Hill, they gained their object in 1881, subject to the suzerainty of Queen Victoria. Gold had been worked since 1869, but it was the discovery of the Witwatersrand goldfields in 1886 which opened up the country to prospectors. It brought a great influx of 'Uitlanders,' who were looked upon with considerable disfavour by President Kruger. Difficulties arose, leading to the Jameson Raid and the gauntlet being thrown down to Britain in 1899, culminating in the Boer war, which resulted in the loss of Boer independence in 1902. On May 31, 1910, the T. was merged in the Union of S. Africa. (See SOUTH AFRICA, UNION OF.)

See H. Cloete, *History of the Great Boer Trek*, 1899; W. C. Willoughby, *Native Life on the Transvaal Border*, 1900; P. Kruger, *Memoirs of Paul Kruger*, 1902; W. J. Leyds, *The First Annexation of the Transvaal*, 1906; G. McCall Theal, *History of South Africa since 1796*, 1916–20; C. L. Harries, *Laws and Customs of the Bapedi of the Transvaal*, 1929; A. K. Bor, *A Century of Education in the Transvaal*, 1936; *Cambridge History of the British Empire*, vol. viii, 1936; D. Jacobsen, *Fifty Golden Years of the Rand*, 1936; J. Gray and E. L. Gray, *Payable Gold*, 1937.

**Transverse and Transversal**, in geometry, the straight line drawn intersecting two parallel straight lines. The angles formed are thus related: (1) alternate angles are equal; (2) the exterior angle is equal to the interior and opposite angle on the same side; (3) the sum of the two interior angles on the same side is equal to two right angles.

**Transylvania**, prov. of Rumania. The Carpathian Mts. lie on its E. boundary, and the Transylvanian Alps to the S. The area is 22,312 sq. m. The surface is tableland, mountainous over the greater part, and is watered by the numerous affluents of the Pruth and the Theiss. The minerals include gold, silver, copper, iron, quicksilver, lead, and salt. Stock-raising, agriculture, and fruit-growing are important industries; wine is made and brandy distilled. A fertile plain in the centre of the country yields large crops of maize, wheat, rye, flax, hemp, potatoes, and tobacco. There are 5,560,000 ac. of forest. Cluj (former Kolozsvár or Klausenburg), Brasov (Brasso, Kronstadt) and Sibiu (Nagyseben, Hermannstadt) are the chief tns. A univ. was founded at Cluj in 1919. Pop. 3,100,000, consisting of Rumanians, Magyars, and Gers. T. corresponds with the Rom. Dacia, which was overrun by the Huns under Attila in the fifth century. This invasion was followed by incursions from the Gepidae, the Avars, the Slavs, and the Magyars under Almus, who appeared at the close of the ninth century. In the thirteenth century many thousands of Gers. settled in T., which in the sixteenth century became a principality when John Zápolya, the voivode of T., threw off his allegiance to the emperor and acknowledged the suzerainty of the sultan. In the early part of the nineteenth century

efforts were made to bring about a union with Hungary, which ended in T. being made a crown land of Austria in 1849. In 1868 the principality was merged into the Austro-Hungarian empire. As a result of the First World War Rumania gained accessions of ter., including T. (confirmed by the treaty of St. Germain, 1919). In Aug. 1940 Hungary with Ger. support denounced the return of T. A settlement was then imposed by Germany and Italy. On Aug. 30, 1940, Hitler

the 1938 frontiers between Rumania and Hungary were restored, placing T. in Rumania. See E. Gerard, *The Land Beyond the Forest*, 1888; L. von Sawicki, *Beitrage zur Morphologie Siebenburgens*, 1912; N. Jorga, *Histoire des Roumains de Transylvanie et de Hongrie*, 1915-16; J. Cabot, *The Racial Conflict in Transylvania*, 1926; W. Starkie, *Raggle-Taggle*, 1933, 1947; T. G. Clupagea, *Nouvelles donnees sur la structure du bassin transsylvanien*, 1935.

**Trap**, term applied vaguely, in geology, to any dark-coloured fine or medium grained basic igneous rocks, such as dolerite and diabase. Mica-trap is the name applied to mica-lamprophyre. These trap rocks occur as dyke rocks and lava flows.

**Trapani**, seaport on the N.W. coast of Sicily, cap. of the prov. of the same name. It is an episcopal see, and has a famous statue of the Madonna. There is trade in agric. produce, and in coral and mother-of-pearl goods. It was originally a Carthaginian fortress. T. sustained considerable damage in the Second World War. The tn. fell to the Amer. Seventh Army in Aug. 1943. Pop. (tn.) 74,100; (prov.) 421,000.

**Trapassi, Pietro Antonio Domenico Bonaventura**, see METASTASIO.

**Trapezium and Trapezoid**, in Euclidian geometry, are plane quadrilateral rectilinear figures; the former has no parallelism between opposite sides, the latter has one pair of opposite sides parallel.

**Trapezoid**, see TRABZON.

**Trapping**, art of so constructing mechanical snares as to capture or kill some animal. The art is probably one of the oldest in existence, since even the earliest and most uncultured peoples of whom we have any record used traps, although they were usually devoid of any mechanical contrivance, and merely consisted in the digging of a cavity into which the unsuspecting victim fell. Bird traps, on the cage principle, and door traps are traps used for the purpose of capturing the victim without injury. Other traps are so constructed that they seize the victim, but at the same time, except under special circumstances, do it no injury; whilst a third variety consists of a mechanical contrivance not only for capturing but for killing the victim.

**Trappists**, name usually given to a branch of the Cistercian order reformed by Dominique Armand Jean le Bouthillier de Rancé (1626-1700). Until the age of thirty-four de Rancé led the voluptuous life of a courtier-priest. Then in 1660 a sudden change came over him and he retired to live a life of austerity and devotion in the Cistercian abbey of La Trappe, which had long formed part of his possessions. The abbey, which had been founded about the middle of the twelfth century, was lax in discipline, and it was with the greatest difficulty that de Rancé introduced his strict observance. The new community devoted itself to the observance of strict silence and seclusion from the world, to hard labour, to total abstinence from wine, meat, eggs, fish,



Rumanian Legation

#### A WOODEN CHURCH IN TRANSYLVANIA

summoned the Prince Bishops of Hungary and Italy to Vienna to accept the terms of the so-called Vienna award by which more than half of T. was ceded to Hungary, including valuable mines and agric. and forest land. The pop. of the ceded ter. was over two million, nearly half of which was Magyar. The Russian army entered T. in Aug. 1914. In March 1915, Stalin announced his support of the Rumanian claim to T., and on March 10 the ter. was restored to Rumania. This was confirmed by the peace treaties between the Allied and associated powers with Rumania and Hungary (Feb. 10, 1947). By the terms of these treaties

and all seasoning of their simple diet of bread and vegetables. The reform of La Trappe spread to other houses, and is found today all over the world, even in China. There are Trappist monasteries at Coalville, Leicestershire, Caldy Island, S. Wales, and Mount Melleray and Roscrea, Ireland. See L. F. Du Bois, *Histoire de La Trappe*, 1924; Y. von Estienne, *Les Trappistes*, 1937; and T. Merton, *Elected Silence* (in U.S.A., *Seven Storey Mountain*), 1949.

**Trasimene Lake**, also known as **Lake Perugia**, in Umbria, Italy. In 1898 it was partially drained into the Tiber, some 5500 ac. of land being reclaimed. It is famous for Hannibal's great victory over the Romans under Flaminius, gained on its shores in 217 B.C.

**Traumatic Neurosis**, see under **SHELL-SHOCK**.

**Trautenuau**, see **TRUTNOV**.

**Travancore**, state of India, stretching along the Malabar coast from Cape Comorin to Cochin, its shores being washed by the Indian Ocean. It is 140 m. long, with a max. breadth of 70 m. The coast is low, but the foothills of the W. Ghats diversify the scenery and slope towards the ocean. Its cap. is Trivandrum. After 1923, as one of the Madras states, it was brought into direct relation with the Indian Gov. and in 1949 T and Cochin were formed into a union. Chemicals, glass, rubber, and ceramic industries are powered from a hydro-electric station at Pallisaval. Other products are copra, areca nuts, beeswax, tea, ginger, cardamoms, coffee, pepper, and timber. Area 76,602 sq. m. Pop. 6,070,000.

**Travel and Holidays Association, British**, see **TOURIST AND HOLIDAYS BOARD, BRITISH**.

**Traveller's Joy**, see **CLEMATIS**.

**Traveller's Tree**, or *Ravenna madagascariensis*, tree with long and large fan-shaped leaves, the petioles or leaf stalks of which form a large cavity at their base, in which water collects, forming a useful store for travellers and animals.

**Traverse**, in mountaineering, a lateral movement across rock, snow, or ice, usually undertaken when a direct ascent is impossible. During a T. the leader can be safeguarded by the second man on the rope. The term is also applied to any expedition across a mt. or ridge from one valley to the next.

**Traverse**, in pleadings, means denying the whole or some essential part of the averments of fact contained in the opponent's pleading. There are two other ways of dealing with the opponent's pleading, namely, by *confession and avoidance* (q.v.) and by an *objection in point of law*. Formerly the party pleading had to elect which of these three courses to adopt, but now he may adopt either or any of these methods, though a good pleader will not multiply the issues needlessly, for the client may be ordered to pay the costs of the issues on which he fails. A T. cannot be made to do the work of a plea in confession and avoidance; its office is to contradict, not to excuse. Matter justifying an act may not be

inserted into a plea which denies the act. As a rule the burden lies on the opponent to prove at the trial the facts which are traversed in the pleadings. There are three fundamental rules in traversing: every allegation of fact, if not denied specifically or by necessary implication or stated to be not admitted in the pleading of the opposite party, will be taken to be admitted (except as against an infant, lunatic, etc.); each party must deal specifically with each allegation of fact of which he does not admit the truth, except damages; and when a party denies an allegation of fact in the previous pleading of the opposite party, he must not do so evasively, but answer the point of substance.

**Traverser Bridge**, see under **BRIDGE**.

**Travertine**, or **Calc-sinter**, is porous calcareous material deposited from mineral springs (q.v.). There are well-known T. deposits at Tivoli, near Rome, and in the Auvergne dist. of France. T. may be chalk-like in texture, but is often hard enough for building stone, many of the buildings in Rome (e.g. St. Peter's) being built with it. At San Filippo the T. is deposited at the rate of 3 ft. a year.

**Trawling**, see under **FISHERIES**.

**Treachery**, see under **TREASON**.

**Treacle**, see **MOLASSES**.

**Treadmill**, mill known as 'the everlasting staircase,' worked by persons treading on steps fixed on the periphery of a wheel. It was once used as a means of prison discipline, or to give useful employment in the shape of grinding corn or moving machinery to persons imprisoned for crime, and came under the category of 'hard labour.' The prisoners held on to a hand rail and worked in separated compartments, the speed being regulated by a warder by means of a lever.

**Treason**, means treachery against the sovereign. By the Statute of Treasons, 1351, it is T. (1) To compass the death of the king, queen, or their eldest son. 'Compass' imports design, which must be manifested by an overt act (e.g. providing weapons), for idle words do not now constitute T., though they may amount to a misdemeanour. The conviction of Pea-cham and Sydney shows that the commission, even without pub. of 'treasonable' ideas to writing is T., but it is extremely doubtful whether a modern judge would direct a conviction for T. at the present day. (2) To violate the king's companion, eldest unmarried daughter, or eldest son's wife. (3) To levy war against the king in his realm. This includes levying war to reform religion, remove councillors, or redress grievances, inasmuch as private persons may not forcibly interfere in grave matters, e.g. in Anne's reign Damarco and Purchase were convicted of T. for burning certain dissenting meeting-houses, the court inferring a *general* design against the state. (4) Adhering to the king's enemies in his realm by giving them aid in his realm or elsewhere. The over-shadowing power of present-day central govs. makes it grotesque for any individual to hope to approach a project of rebellion in

England with the prospect of even partial success. When the case of *R. v. Lynch* (1903) came before the courts there had not previously been a charge of high T. tried for sixty-two years. It was moved to quash the indictment (*q.v.*) in this trial on the ground that each count charged an adhering 'without the realm' (*viz.* in the Transvaal), and so disclosed no statutory offence. The court held that the statutory words did not mean merely that the accused *being in the realm* has been adherent to the king's enemies *wherever they were*, for that so narrow a construction not only would enable an Englishman to engage with a hostile Power against his own country so long as he took care to remain abroad, but also makes the words 'or elsewhere' meaningless. (5) Counterfeiting the king's seal or money or importing money (not now T.). (6) Slaying the chancellor, treasurer, or king's justices. The punishment for T. was formerly hanging, drawing, and quartering after the traitor had been dragged to the place of execution on a hurdle; it is now hanging only. T. cannot be committed against a *de jure* king who is not also *de facto* king. In the case of Roger Casement (*q.v.*) in 1916 it was decided that a man may 'adhere to the king's enemies in his realm' and be found guilty of T. whether the act complained of was committed within or without the realm.

Early in the Second World War a new Treachery Bill was passed in the House of Commons. Its object was to close up any legal loophole which might be found in the auct. statute and its interpretations; for instance, it was not clear to whom the former Acts could be extended and whether they applied to all aliens or only those normally living within the king's jurisdiction. They might, in consequence, be held to be inapplicable to aliens coming into this country under the guise of refugees for the sole purpose of espionage or sabotage. Secondly, the crime of T. because of its gravity, was accorded a special form of trial, and it was in order to avoid a cumbersome procedure that the new Bill was necessary, so that persons accused of treachery under Clause I. could be tried in accordance with the ordinary procedure of the courts. The third reasons why new legislation was thought advisable was to make provision whereby enemy aliens could be tried in suitable cases by court-martial, though any Brit. subject or neutral alien retains the right to be tried by jury. Finally, in accordance with the old Treason Laws, the Treachery Bill imposes the death penalty for persons found guilty under it.

The trial of William Joyce for T., in 1945 (appeal dismissed by the Court of Criminal Appeal, Nov. 7, 1945, and by the House of Lords, Jan. 31, 1946), estab. important points of legal principle. The majority judgment decided that an alien can in law be guilty of T. to the sovereign in respect of an act committed outside the realm. The case establishes that an alien, as long as he holds a Brit. passport, commits T. within the meaning of the Statute of 1351, if he adheres to the king's enemies.

In effect, a passport issued by the British authorities imposes on an alien the obligation of allegiance to His Majesty; and that obligation is equally binding within and without the realm.

By the constitution of the U.S.A., T. consists in levying war against them or in adhering to their enemies, giving them aid and comfort. The punishment by an Act of 1790 is death by hanging; it was altered at the time of the Civil war to death, or at the discretion of the court imprisonment for at least five years with hard labour and a fine of not less than \$10,000; this included disability to hold office. In some state constitutions there are provisions for T. against the State as distinct from the Federal Gov.

'Treasure State,' see MONTANA.

**Treasure Trove.** Money, plate, or similar articles discovered hidden in the earth or some other secret place for so long a time that the owner is unknown. In default of finding the owner, the estab. principle of Eng. law is that the crown is entitled to the treasure. Finders are legally entitled to obtain the market value of their discoveries, without any deduction for expenses. The chief finds in Great Britain are of gold and silver coins, and the orthodox definition of T. T., 'objects of gold or silver which have been hidden in the soil or in buildings, and of which the owner cannot be traced,' is repeated in the leaflet issued by the Brit. Museum on the agreement, which points out that finders should report to the coroner either direct or through the police or the Director of the Brit. Museum. If the objects are retained by the crown or a museum, the finder will receive their full antiquarian value; if not retained, he will receive back the objects, or, if he wishes it, the Brit. Museum will sell them at the best price obtainable. See G. F. Hill, *Treasure Trove in Law and Practice*, 1936.

**Treasury**, the central dept. of State concerned with the management of the financial resources of the United Kingdom, control of public expenditure, and supervision over the Civil Service (*q.v.*); it also co-ordinates general economic policy and planning. The origin of the T. Board, consisting of a number of lords commissioners, was the occasion in 1612 on which the office of lord high treasurer was first put into commission; the office has been continuously in commission since 1714. With rare exceptions the first lord of the T. has, since 1721, been the Prime Minister. The chancellor of the exchequer as second lord of the T. is its effective head, and he is assisted by the minister of state for economic affairs, an office first created in March 1950, and by the financial secretary.

**Treasury Bill**, form of Brit. Gov. security, specially suited for temporary borrowing. Introduced in 1877, T.Bs. are usually sold by tender to banks and financial houses at the lowest rate of interest that can be obtained. They are issued in multiples of £1000, repayable in 3, 6, 9 or 12 months. In 1949 the internal unfunded national debt included £4,910,170,000 in T.Bs. or nearly one-

quarter of the total internal unfunded debt, as against £700,000,000 in T.Bs. in 1929 out of a total unfunded debt of less than £6,000,000,000.

**Treasury Solicitor**, legal adviser to the gov. depts. He defends actions brought against ministers or certain other public functionaries. He deals with such intestate estates as escheat (*q.v.*) to the crown. He is generally a qualified barrister. As to his duties in his capacity of King's Proctor, *see under* that title.

**Treating**, *see* ELECTIONS.—*Corrupt and Illegal Practices at Elections.*

**Treaty**. The T.-making power is the prerogative of the crown (*q.v.*), as is the power to conclude peace. The negotiations for a T. are begun by sending to the minister representing the crown in the country with whom the T. is to be made an instrument under the Great Seal (*see* SEAL) containing the authorisation to sign a T. The T. itself usually contains a clause providing for its ratification by both sides, and until the ratifications are exchanged neither party is bound by the T. The crown in theory is the sole T.-making power in England, but it seems to be a settled principle that a T. which lays a pecuniary burden on the people, or which alters the law, requires parl. sanction.

In the U.S.A. Ts. are negotiated by the President, but have to be ratified by the Senate, which has often refused to ratify negotiated Ts., or at times claims the right to ratify only a portion of the projected T. Even after ratification Congress may, in its turn, withhold the necessary legislation to carry the stipulations of the T. into effect.

No satisfactory classification of Ts. is possible because such instruments cover the entire sphere of international relations, but a broad distinction is drawn between those which produce their effect once and for all, such as Ts. of cession and boundary Ts., and those which purport to regulate the relations of the parties for a definite or indefinite period, as, for example, extradition Ts., commercial Ts., alliances, and Ts. of guarantee. It is important to distinguish between mere private arrangements concerning two or more states and those which are concluded by a number of leading states for the purpose of supplementing or amending existing provisions of international law or, in other words, law-making Ts., *e.g.* The Hague Conventions, the Declaration of Paris, 1856, the Covenant of the League of Nations, 1919, and the Charter of the United Nations, 1945. A T. of guarantee may be collective or joint and sev., whereby a guaranteeing state would be obliged to fulfil, if necessary, its obligations alone even though its co-guarantors refused to fulfil their obligations. An historic example of such T. was the Quintuple T. of 1839 (the 'scrap of paper') (*see* QUINTUPLE TREATY), which estab. the neutrality of Belgium. For the states members of the League of Nations the condition precedent of registration of a T. had to be satisfied before the T. came into force. By Art. 18 of the

Covenant (*q.v.* every T. or international engagement entered into by any member of the League had to be registered with the secretariat and be pub. by it, and would not be binding until it was registered. The constituent parts of the United Nations organisation were, at first, almost identical with those of the old League of Nations; but the later Dumbarton Oaks (*q.v.*) document was very different from the Covenant of the League. For, by reason, no doubt, of the fact that the moral aspirations of the Covenant ultimately came to nothing, the Dumbarton Oaks conference produced a plan that invoked no principles, but contained practical arrangements for restraining an aggressor, leaving it for the Yalta conference (*q.v.*) to decide on the rules for voting on the Security Council (*see also* SAN FRANCISCO CONFERENCE). The Charter of the United Nations provides that all Ts. must be registered with the secretariat and pub. by it, otherwise they will not be recognised by the United Nations organisation. Obligations under the Charter override any other T. obligations for members of the United Nations. Ts. affecting the rights of third parties cannot be said to be abrogated or even suspended by war except in so far as war causes for the time being difficulties of performance. But the practice is by no means uniform *e.g.* after the Crimean war, fresh Ts. of commerce were concluded; after the Turco-It. war the treaty of Lausanne, 1912, renewed all Ts. and engagements of every kind existing before that war, and after the First World War the Ts. of peace revived a number of multilateral Ts. of an economic or technical character, in some cases introducing new clauses. With regard to bilateral Ts., each of the Allied states was empowered to revive such of its Ts. with the ex-enemy states as it wished.

In the United Kingdom, subject to possible exceptions, a T. has no effect on private rights, and if the crown concludes a T. which is intended to modify such rights, it must obtain an Act of Parliament to give it that operation. In the U.S.A. it is otherwise, for the 6th Art. of the Constitution provides that 'all Ts. made or which shall be made under the authority of the U.S.A. shall be the supreme law of the land, and the judges in every state shall be bound thereby, anything in the constitution or laws of any state notwithstanding.' Hence when the 9th Art. of the Jay Treaty in 1791 enabled the subjects of either country to hold lands in the other, and to sell or devise them as if they were natives, this stipulation at once took effect in the U.S.A. in favour of Brit. subjects, repealing of itself so much either of common law or of statute law on the disabilities of aliens as stood in its way; while in England an Act of 37 Geo. III. had to be passed to give effect to the reciprocal stipulation in favour of the citizens of the U.S.A. *See The Collected Papers of John Westlake on Public International Law*, ed. by L. Oppenheim, 1914. *See also* bibliography of INTERNATIONAL LAW.

**Treaty Port**, name given to certain seaports in China and Manchuria which were open to European trade by treaty, China being peculiar in that inland navigation was permissible to foreign vessels only by treaty. The earliest of these treaties was that of 1842 following a war between Britain and China. Before the Second World War there were over forty T.P.s., being all the chief ports of the country. Between 1943 and 1947 the Treaty Powers relinquished the extra-territorial rights and privileges in China for which the various treaties made provision. Most if not all the ports were in 1950 in the hands of the Chinese Communists and the position respecting trade relations with them was obscure.

**Treble**, or **Trebizond**, see **TRABZON**.

**Treble**, highest voice in a vocal composition in sev. parts, derived from the Lat. *tripilus*, which was the top part of the earliest three-part Motets. T. is now often taken as the synonym of soprano, but strictly it is so only if it denotes the soprano part in a composition for sev. voices.

**Tredegar**, tn. of Monmouthshire, England, on the Sirhowy, 24 m. N. of Cardiff, and 17 m. N.W. of Newport. The chief industries are coal mining and light engineering. The title of Baron T. has been borne by the family of Morgan since 1859, the family seat being T. Park, near Newport. Pop. 20,000.

**Tree**, **Sir Herbert Beerbohm** (1853-1917), Eng. actor-manager, b. in London, second son of Julius Beerbohm. Educated in Germany, he took the name of T., and made his first appearance on the stage in 1876. His first great hit was as Rev. Robert Spalding in *The Private Secretary*, 1884. Manager of the Haymarket Theatre, 1887-96, he was thenceforth proprietor and manager of Her (His) Majesty's Theatre. He was knighted in 1909. T. was especially famous for his productions of Shakespeare's plays. He pub. lectures on *The Imaginative Faculty* (1893), and on: *Hamlet—From an Actor's Prompt Book* (1897); *Henry VIII. and his Court* (1910), etc. His *Thoughts and Afterthoughts* were pub. in 1913. His greatest strength lay in the presentation of 'character' parts such as Fagin in *Oliver Twist*, D'Oursay in *The Last of the Dandies*, and Malvolio in *Twelfth Night*. See life by Max Beerbohm, 1920.

**Tree**, perennial plant with a woody stem and branches, differing only in size from a shrub. In classification, as in the plant-kingdom generally, trees are divided into two groups, the angiosperms (*q.v.*) and the gymnosperms (*q.v.*). There are four classes of the latter; the cycads, maiden-hair trees, gnetum, and conifer. The angiosperms are further classified in two great groups, the monocotyledons (*q.v.*), and the dicotyledons (*q.v.*), distinguished by the fact that the seedling of the former produces first a single seed-leaf, and of the latter a pair. The monocotyledons are peculiar in form. One great family, palm, consists entirely of Ts. Among the grasses is found the tree-form in, e.g. some

of the bamboos. In the lily family Ts. are represented by the yuccas of Mexico and the dragon-trees of the Canary Is. It is in the dicotyledons that are found the more typical and important Ts.

Ts. are either deciduous, as the oak and elm, or evergreen, like the pine or holly. In palms and some other trees the terminal bud of the primary stem is the only one to develop and thus a long, unbranched trunk is formed. Ts. do not often exceed 300 ft. (the greatest authentic height is 325 ft.). The *Eucalyptus amygdalina* of S. Australia grows to about 280 ft., and the Douglas fir in Brit. Columbia and Washington reaches some 200 ft.

See also **ARBORICULTURE**, **BOTANY**, **FORESTRY**, **PLANTS**, **TIMBER** (law), **TREE-WORSHIP**, and under names of Ts. For fossil records of T., see **Fossils** and **PALAEOBOTANY**.

**Tree-bear**, or **Kinkajou**, (*Cercopithecus caudivolutus*), small cat-like mammal of the racoon family. It is long and feline in body, is covered with soft, yellow-brown hair, and has a remarkably long prehensile tail. It is found in Central and S. America.

**Tree-creeper**, small Eng. bird, the *Certhia familiaris*. See **CERTHIA**.

**Tree-fern**, fern with a trunk-like rhizome, somewhat resembling a tree in structure. Many Ts. belong to the genus *Cyathea*.

**Tree-frog**, name given to members of the family Hylidae. They are widely distributed, especially in America, but absent from Britain. The European T. (*Hyla arborea*) is about 1 m. in length, bright leaf-green above and white underneath, and possesses some powers of colour change. The male has a tinge of brown on the throat. The digits bear adhesive discs, with which it readily climbs even up grass.

**Tree-worship**, in some form or other, seems to be universal. In Europe, the veneration of trees as sacred objects or the habitat of deities continued to a late date and records of it are found in many of the accounts of the early Christian missionaries in the N. The veneration of the sacred oak was a leading feature of the old Prussian religion, it is known that the same tree and its parasite the mistletoe were venerated by the anc. Britons. In Lithuania this form of worship continued down to the fourteenth century. T. falls into two divisions. In the more primitive form the tree is itself considered as an animate being. In the later and more common form it is considered as the residence of a being which can detach itself at will, but whose fortunes are sometimes bound up with those of the tree.

**Trefoil**, name given to various three-leaved plants. More than twenty Brit. species belong to the genus *Trifolium* (Clover). Bird's-foot Ts. are included in the genus *Lotus*.

**Treforest**, see under **PONTYPRIDD**.

**Trefovret**, **Jeanne Alfredine**, see **HADING, JANE**.

**Tregaron**, mrkt.-tn. of Cardiganshire



Wales, 21 m. from Aberystwyth. Pop. 5900.

**Treharris**, vil. in the co. bor. of Merthyr Tydfil, Glamorganshire, Wales, 8 m. S. of Merthyr Tydfil. It is a coal mining area. Pop. 7500.

**Treitschke, Heinrich von** (1834-96), Ger. historian and political writer, b. in Drosden, Saxony. His father was a Lieut.-General and this accounts for the military style of T.'s writing. The family were in good circumstances and T. was able to study at the univs. which were in those days fashionable haunts of the nobility, Bonn, Tübingen, and Heidelberg. In 1859 he obtained his doctorate at the univ. of Leipzig with the essay *Die Gesellschaftswissenschaft: Ein Kritischer Versuch*. This little work determined his future career. T.'s ideas are found in the statement that the science of human society and the science of the State should be the same thing: that the State should be the organised society; and although at that time he was without concrete knowledge of the spirit of the Brit. society and State he mentions England as the example of his theory. He was already both theorist and practical politician, arriving at the conclusion that if Germany was to become united she must be so as a 'Nationale Staat' and under Prussian leadership. He followed this theory throughout his life.

From 1863 until 1866 he was lecturer in hist. at the univ. of Freiburg in Baden. After the Austro-Prussian war he urged Prussia to incorporate the whole of Saxony; thus he, as a Saxon, became a Prussian from choice, and was lecturer at the univ. of Kiel for a short time. From 1867-1873 he was in Heidelberg and in 1874 settled in Berlin for the rest of his life. In 1886 T. became the successor to the famous Prussian historian, Ranke, with the title 'Historiograph des Preussischen Staates.' During these years, eight books were pub., most of them works on political hist. When the new Ger. Empire was founded in 1871 under Prussian leadership, he became a member of the Ger. *Reichstag* as a National Liberal. But this party became too liberal for his feelings and he left it,

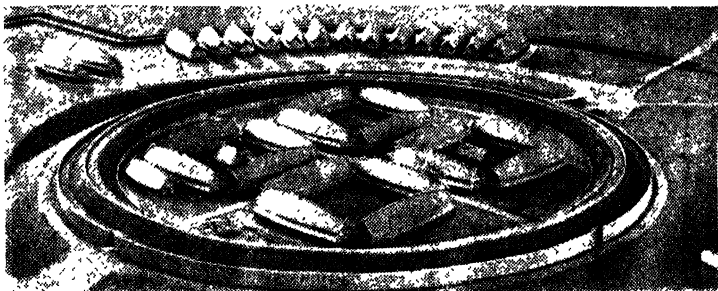
without, however, attaching himself to another party. His greatest achievement was *Deutsche Geschichte im neunzehnten Jahrhundert*, and in the years 1879-94 five vols. of this work were pub.; but when he died the work covered only the years till 1848.

See G. P. Gooch, *History and Historians in the Nineteenth Century*, 1913; H. W. C. Davies, *The Political Thought of Heinrich von Treitschke*, 1914; F. Meinecke, *Die Idee der Staatsrason*, 3rd ed., 1929; H. Kohn, *Völker und Führer* 1914; A. Hausrath, *Life and Works* (Eng. trans. 1914).

**Trelawny, Edward John** (1792-1881), Eng. traveller and writer. In 1822 he met Shelley and Byron in Italy; after Shelley was drowned he was present at the cremation of the body. In 1823 he went with Byron to take part in the Gk. struggle for independence. In 1831 he pub. an autobiography, *Recollections of a Younger Son* (new eds. 1890 and 1925), and in 1858 followed his *Recollections of Shelley and Byron*, repub. in 1878 as *Records of Shelley, Byron, and the Author* (a new ed. by E. Dowden, *Recollections of the Last Days of Shelley and Byron*, appeared in 1906). His *Letters* were ed. by H. Buxton Forman, 1910. See H. J. Massingham, *The Friend of Shelley, A Memoir of Trelawny*, 1930; and life by R. Glyn Grylls, 1950.

**Trelawny, Sir Jonathan** (1650-1721), Eng. divine, b. near Pelynt, held successively the bishoprics of Bristol, Exeter, and Winchester. In 1688 he was numbered among the seven bishops tried under James II. for refusing to conform to the Declaration of Indulgence, but was acquitted. He is the hero of R. S. Hawker's ballad, *And shall Trelawny Die?*

**Trelleborg**, on the is. of W. Zealand, Denmark, is the site of a large and imposing Viking stronghold occupied between A.D. 950 and 1050 which was skilfully excavated with the most modern archaeological technique in 1932-42. A similar but larger fortress is known at Aggersbord on the Limfjord, and in both 'aspiring youth was trained under discipline and fixed regulations for the craft



National Museum, Copenhagen

TRELLEBORG: A MODEL OF THE CAMP BY P. WILLADEN

of war and for the grim voyage over the sea.' Such well-organised and planned strongholds could only have been built under powerful patronage, and it is suggested that King Sweyn Forkbeard was responsible for T. and that units of his troops stationed there may have been among those which invaded Britain. The camp consists of a circular inner ward, with outer defences and other attributes, surrounded by a massive bank of earth strengthened with timber, within which is a regularly laid-out plan of streets, and of barrack buildings now revealed by the holes and slots of their decayed beams in the underlying clay soil. There were four main blocks of buildings, each consisting of four rectangular boat-shaped houses which would accommodate about 1500 men. One house has been rebuilt, the lines of the others being permanently marked, and the site has been given by the owner to the National Museum at Copenhagen. There is good evidence of Roman heritage in the street-plan of the fort and in the fact that the rigid unit of measurement is a Roman ft., but whether it came by way of Byzantium or the military works of the Slavonic peoples is not yet decided. See P. Nørlund, *Trelleborg* (Nordiske Fortidsminder, vol. IV., 1.), 1948, with good summary in Eng.

**Trelø Vuno**, see Hymettus.

**Trematodes**, class of flat worms, with an oval non-segmented body. Many of them are parasitic, and among the most important are *Distomum hepaticum* and *D. lanceolatum*, which cause liver fluke (q.v.) in sheep and other ungulates, also *Amphistomum Collinsii* and *Gastrodiscus Egyptiacus*, both of which infest the intestines of horses, and *Bilharzia crassa*, a blood parasite of cattle and of man in the tropics, this and other species lay their eggs in the bladder and rectum, and are the cause of *bilharziasis*.

**Tremolite**, see Amphibole.

**Trench, or Trench Warfare**, in military engineering, a T. is an excavation in the earth used to protect infantry from the enemy's fire. T.W. was an almost entirely new method of fighting when adopted early in 1915 in the First World War, though its principles had been applied as early as the Russo-Japanese war of 1904-5. Old principles were largely discarded when the war of movement or *guerre de manœuvre* on the W. front ceased and the lines of the opposed forces became stabilised in trenches extending from Alsace to the Belgian coast. In the course of the four years of T.W., Ts. became most elaborate examples of field fortifications. There were advance or fire Ts. so sited that the occupants could fire on the enemy: support Ts. farther to the rear to give cover for troops sufficiently near the front line to be able to reinforce it at need, and sometimes arranged so that the occupants could fire over the front line Ts.; and communication Ts. which provided a zig-zag road for troops to pass between the front line and support Ts. and positions farther to the rear without being exposed to enfilade fire. Among weapons specially

developed for T. warfare were a cutter for excavation and a mortar for throwing bombs against hostile machine-gun emplacements and sniper's posts or into the enemy's Ts. (see MORTAR). A disease known as T. fever developed among soldiers serving in the Ts. A feature of this T.W. was that advances were usually small and extremely costly in casualties.

**Trenchard, Hugh Montague**, first Viscount (b. 1873), Brit. soldier, airman, and administrator, entered the Army in 1893 and served with distinction in the S. African War (1899-1902). In 1912 he obtained his air pilot's certificate and in 1911, in the First World War, was commandant of the military wing of the Royal Flying Corps. In 1915 he was appointed chief of the air staff. Colonel in 1915, and major-general in 1916, in 1918 he was appointed to command the independent Air Force in France. In 1919 he was again chief of the air staff, which position he held for ten years, becoming air chief marshal, 1919. He was created baronet in 1919, and G.C.B., 1924, and was raised to the peerage in 1930, becoming Viscount in 1936. From 1931 until 1945 he held the post of Commissioner of the Metropolitan Police Force; the Hendon police college was one of the reforms instituted by him.

**Trendelenburg, Friedrich** (1841-1924), Ger. surgeon. He is chiefly known for (1) *T.'s position* with the patient lying face uppermost and the pelvis raised; this is useful (q.v.) for gynaecological operations, since the intestines are kept out of the field; (2) *T.'s operation*, for pulmonary embolism.

**Trengganu**, one of the former United Malay States (see MALAYA) under Brit. protection. It lies on the E. coast of the Malay Peninsula, and is bounded by Kelantan (q.v.) on the N. and N.W., by Pahang on the S. and S.W., and by the China Sea on the E. Its inland boundaries follow the watersheds of its larger rivers, the Besut, Trengganu, Dungun, and Kenaman. The W. and inland half is mountainous and almost uninhabited. The pop. is concentrated on the rivers, and along the coast line. The highest peak is Gunung Lawit (4985 ft.). The administrative centres are Besut in the N., Kuala Trengganu in the centre and Kenaman in the S. The seat of gov. is at Kuala Trengganu, which is also the residence of the Sultan. Nearly all the characteristic commodities of the Malay States are produced in T.

The early hist. of T. is obscure. A Chinese Buddhist monk and traveller, Chau Ju Kua, mentions it among places subject to the old kingdom of Palembang. A Javanese work, the *Nagarakretagama*, written 1365, speaks of both T. and Dungun as tributary to Majapahit (see MALAYA, History). The discovery in 1923 of a Malay stone at Kuala Brang, 20 m. from Kuala Trengganu, with a remarkable mixed Malay-Arab inscription, dated 702 A.H. (A.D. 1303) on the subject of the Islamic law of sexual offences, points to the existence of a Mohammedan kingdom in the upper Trengganu R. a century

before the recorded date of the Mohammedan conversion of Malacca. This stone is now in the Raffles Museum, Singapore. The ruling house of T. is descended from the ancestor of the present rulers of Johore and Pahang. In 1776 Sultan Mansur (1730-1792) sent the *bunga mas* or golden flower to the king of Siam and this practice was continued until, by a treaty in 1909, the Siamese Gov. transferred to Great Britain all rights of suzerainty over the States of Kelantan, Kedah, Trengganu, etc. A treaty in 1910 between Great Britain and T. provided that T. should receive a Brit. officer to reside in T. to be an Agent with functions similar to those of a consular officer. In 1919 this provision was cancelled and a Brit. Adviser substituted, whose advice must be sought and acted on in all matters affecting the general administration of the country and all questions other than those touching the Mohammedan religion. Area 5050 sq. m. Pop. 241,000.

**Trent, Jesse Boot**, first Baron (1850-1931), Brit. industrialist, b. at Nottingham, founder of Boot's Pure Drug Company. As a boy he worked in a herbalist's shop owned by his mother, but after about fourteen years he had a shop of his own. In 1883 he formed the company of J. Boot and Co., Ltd., which was among the first 'chain stores' in the country. Five years later the company became Boot's Pure Drug Co. and by 1896 owned sixty shops in thirty towns. B. was a munificent patron of education, and among his donations was the sum of £500,000 to build Univ. College, Nottingham (see also under NOTTINGHAM UNIVERSITY). he was an active Liberal. Knighted in 1909, he was created a peer in 1929.

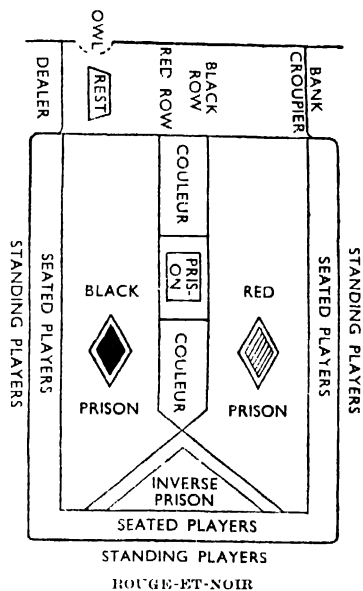
**Trent**, third most important riv. of England, rising in Staffordshire and flowing through the cos. of Derby, Leicester, Nottingham, and Lincoln, eventually joining the Ouse to form the Humber. It is about 170 m. long, and is connected with other rivs., and with the Birmingham and Lancashire dists. by the Trent and Mersey and Grand Union canals.

**Trent**, see TRENTO.

**Trent, Council of**, the 19th eccumenical council of the Church. It was convoked by Pope Paul III in 1545 to restore peace to the church, then distracted by the teaching of Luther and other reformers. It sat till 1563 and passed a number of decrees defining doctrines questioned by the Protestants and reforming abuses. The Council was of considerable importance as laying down the main lines of Rom. Catholic development in post-Reformation times. Its decrees were confirmed by Pope Pius IV. in 1564.

**Trente-et-Quarante**, or **Rouge-et-Noir**, is played with six packs of cards on a table (see diagram) marked out for the game. The cards having been shuffled, one of the players cuts, and so many cards are dealt out face upwards in a row, until the sum of the pips exceeds 30 in number. The court cards and tens count 10 each, and the aces 1. A second row is then

dealt out below the first one, until the pips in this row also exceed 30. The top row (see diagram) is called 'black' and the second 'red,' the winning row being that which contains the fewer pips. A total of 31 would be the best possible, and 40 the worst possible 'point.' Players can also put their stakes on couleur or inverse. The four even chances, black, red, couleur, and inverse, are played and paid in precisely the same way as the even chances in roulette. The chances couleur and inverse are decided by the colour of the first card turned up. If the colour corresponds with the colour of the row containing the fewer pips, couleur wins; if with the other row, inverse wins. Playing may be *à cheval*, i.e. on combinations of the above, either on red and



couleur or black and couleur, red and inverse or black and inverse. Staking *à cheval*, i.e. on combinations of the above, either on red and couleur or black and couleur is the same as staking on the line between red and impair, or noir and pair at roulette. If both chances win, the bank pays even money; but if both lose the stake is lost. If one wins and the other loses, the bet is 'off,' and the player may either take his stake up or leave it for the next coup. Where both rows total 31, the result, which is called a *refait*, is analogous to that in roulette when zero appears, i.e. the stakes are put *en prison*, and after the ensuing deal the stakes on the winning chances are withdrawn from prison and the others lost. But instead of being put in prison in the first instance, the player

may, at his option, as at roulette, halve his stake with the bank. If, however, the player chooses to go into prison, he has the option to choose the prison before the next deal; and if he selects the right coloured prison (*see* diagram), *e.g.* if he chooses red, and the red chance wins the next coup, he can do as he likes with his stake. If, on the other hand, a second *refait* appears, he must win twice in succession before he can withdraw his stake. If the two rows come out at the same total of any number over 31, the coup is null and void, and the stakes may be removed from the table or not, as the players choose. A *refait* is said to occur once in 38 deals on the average, which, if true, would give the bank a slightly less advantage than at roulette where it is 1 in 37. Again, the odds against black and red both totalling 31 are 81 to 1. The punter or 'player', however, is at liberty to insure against the *refait* by paying one per cent. on his stake; but a minimum premium payment is set by the bank. The effect of insuring is that, if the *refait* appears, the punter's stake does not go into prison, and he is at liberty to remove it. *See* H. Jacobson, *Roulette, trente-et-quarante and boule*, 1928.

**Trentino**, dist. of N. Italy, formerly part of the Austrian Tyrol and now, under the new Constitution, part of the Trentino-Alto Adige region for administrative purposes. In the widest sense the name embraces the whole of the area between Lake Garda and the Brenner Pass ceded by Austria under the treaty of St. Germain-en-Laye, 1919. It is mountainous and lies on both sides of the Adige surrounding the beautifully situated tn. of Trento (or Trent), which is 57 m. N. of Verona. Its area is about 2,40 sq. m. Though essentially an It. region it had, before the First World War, become part of the Austrian Tyrol, thereby leaving 400,000 Its. under Austrian rule. It was the scene of prolonged fighting between the Its. and the Austrians in the First World War, particularly in 1916. The last considerable fighting in the T. was the Austrian offensive in June 1918. Trent was occupied on Nov. 3, the day before the armistice. (*See* further under ITALIAN FRONT, FIRST WORLD WAR CAMPAIGN ON).

**Trento**, or **Trent**: (1) tn. of Tyrol, Italy, stands in a beautiful situation on the Adige. T., the anc. *Tridentum*, has embattled walls and a large ruined castle. It is the seat of a bishop and has a splendid marble cathedral. In its former church of Sta. Maria Maggiore sat the famous Council of T. (q.v.). T. is noted for its manufs. of silk, pottery, playing-cards, and wine. It passed from Austria to Italy after the First World War. Lying alongside the vital railway to the Brenner Pass, the tn. suffered severely in the Second World War. Pop. 61,000. (2) Prov. of N. Italy. Pop. 392,300.

**Trenton**, cap. of New Jersey, U.S.A., on the Delaware R. It is an industrial centre, noted especially for pottery, but iron, steel, and copper wire, tobacco, rubber, electrical apparatus, wool, and

linen are also manufactured; power is supplied from hydro-electric works. Pop. 124,700.

**Trepang**, *see* BÊCHE-DE-MER.

**Trepanning** (Gk. *τρύανω*, to bore), operation of boring a circular hole, usually in the cranium to permit entry to the brain. The instrument used is a trepan (trophine) and resembles a carpenter's bit provided with a handle. The discovery of prehistoric skulls bearing circular scars with signs of healing shows that T. is an operation of great antiquity, being performed presumably for the purpose of releasing imaginary evil spirits and devils. Nowadays it is carried out in operations on the brain, and also to relieve excessive intracranial pressure resulting for instance from a fracture of the skull. T. is also performed with miniature trephines on the eyeball and on the drum of the ear. *See* D. Guthrie, *History of Medicine*, 1945.

**Tres Arroyos**, tn. of Argentina, in the prov. of Buenos Aires, 110 m. E. of Bahía Blanca and 270 m. S.W. of Buenos Aires on the Roca Railway. It is the centre of a thriving agric. and live-stock dist. Pop. 40,000.

**Tresco**, one of the Scilly is. and the second in size; lies 1 m. N.W. of St. Mary's. The area is about 700 ac., and it contains the ruins of a Benedictine abbey.

**Trespass**, in a wide sense, denotes any transgression (not amounting to a felony) whether it relates to person or property. Hence striking another, and detaining another's goods, constitute T., as also default in the performance of a contract, and any misfeasance which results in loss or damage to another. In a narrower and more popular sense it denotes an unauthorised entry on another man's land, though in law no T. is committed unless there is some damage *however inconsiderable or even technical* (*e.g.*, 'bruising the grass' was the customary allegation in a writ of T. for 'breaking a close'). But technically the highly complicated notion of T. connotes essentially 'adverse contact' whether to person or property. This kind of T. in the language of old pleadings (*q.v.*) was called T. *vi et armis* (by force and arms) (*see* also KING'S BENCH DIVISION). If the notion of T. had stopped here, its meaning would have been certain; but the common law extended it so as to embrace acts not involving contact, and not *per se* immediately injurious, but only injurious *by consequence and collaterally*. This was called *special trespass*, or *trespass on the case*.

**Tret**, *see* TAKE AND TRET.

**Trevanna**, *see* BOSSINKEY.

**Trevelyan, George Macaulay** (b. 1876), Eng. historian, third son of Sir G. O. Trevelyan. Educated at Harrow and Trinity College, Cambridge, during the First World War he was Commandant of the 1st Brit. Ambulance Unit in Italy. He became Chevalier of the Order of St. Maurice and St. Lazarus (Italy), 1920; C.B.E., 1920; and O.M., 1930. From 1927 he was Regius Professor of Modern History at Cambridge Univ. until 1940 when he became Master of Trinity College.

Writings include: *England in the Age of Wycliffe* (1899); *England under the Stuarts* (1904); *The Poetry and Philosophy of George Meredith* (1906); *Garibaldi and the Making of Italy* (1911); *The Life of J. Bright* (1913); *Scenes from Italy's War* (1919); *Lord Grey of the Reform Bill*, (1920); *British History in the Nineteenth Century* (1922); *History of England* (1926); *England under Queen Anne* (1930); *The Peace and the Protestant Succession* (1934); *Sir George Trevelyan: A Memoir* (1936); *Grey of Fallodon* (1937); *The English Revolution, 1688* (Home University Library) (1938); *English Social History: A Survey of Six Centuries* (1914; illustrated ed. 1949); and *An Autobiography and Other Essays* (1919). He holds hon. doctorates of many Brit. and Amer. univrs. Chancellor of Durham Univ., 1949. T.'s publs. combine great scholarship with readability: his *English Social History* was an out-standing best-seller.

Trèves, *see* TRIER.

**Trevisa, John de** (c. 1322-1402), Eng. author, b. in Cornwall. He was at Exeter College, Oxford (1362-65), and fellow of Queen's (1369), and from 1362 he held the vicarage of Berkeley, where he is buried. He trans. for the fourth Baron Berkeley, the Benedictine Ranulf Higden's (c. 1299-1363) historical and general compendium the *Polychronicon*, the first historical work in Eng. prose since the *Anglo-Saxon Chronicle*. The trans. was completed in 1387, printed in 1482 by Caxton, and long remained a standard work. He also trans. Glanville's *De Proprietatibus Rerum*, and other Lat. works.

**Treviso**, cap. of the prov. of Treviso, Italy, is seated on the Sile at its junction with the Piavesella. Its cathedral, dating from the twelfth century, contains paintings by Veronese and Titian. During the First World War it was a base of the It. army. The tn. suffered considerable damage in the Second World War. T. fell to the Allies in April 1945. Pop. (n.) 51,000; (prov.) 630,600.

**Trevithick, Richard** (1771-1833), Eng. inventor of locomotives; b. at Hlogun, Cornwall, the only son of Richard T., mine-manager and friend of Wesley. He attended Camborne School, but was frequently truant; he was a notable wrestler and weight-lifter. About 1797, T. made a steam-engine for Horland mine, and in 1800, made a double-acting high-pressure engine for Cook's Kitchen mine. Having experimented with model locomotives from 1796, he completed by the end of 1801 the first steam carriage that ever drew passengers; another, in 1803, worked for a short time in London. In Wales, Feb. 1804, he put the first practical rail locomotive into use; it had a fly-wheel, and did not work long. T. was the first to turn steam-exhaust into the chimney and to rely on friction of smooth rails and wheels. In 1809 he failed in an attempt to make a tunnel under the Thames. He made a steam threshing-machine, 1811. In 1816 T. went to Peru, where his engines were being installed in the mines, and lost all his

property in the insurrection of the 'twenties. He prospected for an inter-oceanic railroad in Costa Rica. T. took out his last patent, 1832, for superheated steam; but he had numerous unpatented projects, including a stern driving propeller. He died in Dartford penniless. *See* Lives by his son, Francis, 1872, and H. W. Dickinson and A. Titley, 1934.

**Triad**, (1) In religion and mythology, a group of three related deities. In Brahmanism, the Hindu T. denotes the three leading Hindu gods, Brahma, Vishnu, and Siva (*see also* TRIMURTI). They characterised the second great development of Hinduism, Brahma not figuring at all in the Vedic hymns, Vishnu there being only the god of the shining firmament, while the conception of Siva was evolved from that of the Vedic Indra, the god of storms. The Sumerians had a T. of gods called Anna, Enki, and Enki. Here originated the Babylonian T. of Anu, lord of heaven, Bel, lord of earth, and Ea, lord of the abyss, dividing the universe between them, as did Zeus, Poseidon, and Hades among the Gks. In the religion of anc. Egypt there was, from the time of the Hyksos, a marked tendency to identify every god with the Sun Ra, and add his name to theirs. This process of syncretism is found in most religions, but it is nowhere so noticeable as in Egypt. It marks an assertion of the latent belief in monotheism, but in priestly and philosophic circles it helped to supply the basis for a pantheistic creed, whence the process of combination also took the form in Egypt of triads and enneads (of nine deities, a later attempt at systematic grouping). In Egyptian religion the T. in any dist. consisted of a goddess, a god, and their son. As the gods were mortal the son was destined to take his father's place and therefore he was his exact counterpart. This was perhaps only a symbolic way of expressing the idea of eternity. In other instances the family T. was replaced by a simple combination of unrelated deities. In Chinese religion, corresponding to the Buddhist trinity, are the Three Holy Ones, instructors and benefactors of mankind, whose immense images are, or were, worshipped in every Taoist temple. One of these is variously said to be actually Lao-tze raised to this eminence by merit, or to have been incarnate in his human person. In Scandinavian religion, Thor, Odin, and Loki formed an early Scandinavian T. of gods always warring against the giants, who represented the rude forces of nature.

(2) A Welsh form of literary composition depending on arrangement in groups of three. The Welsh Ts. are an arrangement of similar subjects, things, or events in series of three under some general title suggesting that they were more or less connected. Among the best-known are the Ts. of Horses, which are included in the twelfth-century *Black Book of Caernarthen*; the Ts. of Arthur and his warriors, believed to be of the thirteenth century; the Ts. of the Island of Britain, in the Red Book of Hergest (a fourteenth-

century MS. in the possession of Jesus College, Oxford; and the fifteenth- or early sixteenth-century Ts. of *Dyfnwal Moelmad*, a legendary king of Britain.

(3) In the hist. of the origin of the hierarchical system, the word T. is used in the writings of Dionysius Pseudo-Areopagita in treating of the celestial and eccles. hierarchies. Thus, in the celestial are the three Ts. of seraphim, cherubim, and thrones; dominations, virtues, and powers; principalities, archangels, and angels. In the eccles. or earthly hierarchy the first or highest T. is formed by baptism, communion, and chrism (*q.v.*); the second by the three orders of the ministry, bishop or hierarch, priest, and minister or deacon; the third T. is made up of monks, 'initiated,' and catechumens.

(4) In chemistry T. is the name given to those elements which can directly unite with or replace three atoms of hydrogen, chlorine, or other monatomic element. The Ts. are boron, gold, indium, and thallium.

(5) In music T. denotes a common chord or harmony, because it is formed of three radical sounds: a fundamental note or bass, its third, and its fifth. Ts. are said to be major or minor, augmented or diminished.

**Trial.** Ts. of civil actions in England respecting common law matters (*i.e.*, generally speaking, breaches of contract and torts, *see* TORT) if tried in the High Court may be either before a judge and jury or by consent before a judge alone. Actions in the commercial list are tried before a judge alone (*see* COMMERCIAL COURT). Actions involving accounts are assigned for T. before official referees. Actions touching matters of equity (*q.v.*) are tried exclusively before judges only, similarly in the case of bankruptcy matters. Admiralty causes are tried before a judge of the Probate, Divorce, and Admiralty Division with or without the aid of nautical assessors (*see* EVIDENCE; TRINITY HOUSE). Divorce petitions, if undefended, are disposed of by a judge alone; if defended may or may not be tried before a jury at the discretion of the court or a judge. Notice of T. may be given by the plaintiff or other party in the position of plaintiff. Such notice may be given with the plaintiff's reply whether the latter closes the pleadings or not, or (in other than Admiralty actions), where no order for a reply has been made, on the expiration of four days after the defence or list of the defences shall have been delivered, or at any time after the issues of fact are ready for T. The notice of T. must state the place and the day which the plaintiff proposes for the T. and must be given at least ten days before that day, unless the defendant has consented, or has been ordered to accept short notice of T., which is usually four days. In every action in every division of the High Court the place of T. is fixed by a master and in fixing the place regard will be had to the convenience of the parties and their witnesses. The plaintiff, however, has *prima facie* the right to select the place of T. and the

defendant must show a distinct preponderance of convenience to oust him of this right. But the defendant will be entitled to have the venue changed if he can show that there is no probability of a fair T. in the place the plaintiff has selected. A plaintiff who proposes to try at some place other than Middlesex must name the place in his original Statement of Claim. If the plaintiff does not within six weeks after the time when he first becomes entitled to give notice of T. (or within such extended time as the court or a judge may allow) give notice of T., the defendant may himself give notice of T. or apply to the court or a judge to dismiss the action for want of prosecution. If the action be for trial at assizes, the notice must be entered either at the district registry of the assize tn. or with the associate of the circuit. The rights of the parties to a jury in civil cases have been limited by the Administration of Justice (Miscellaneous Provisions) Act, 1933. It is now a matter for the discretion of the master in most actions in the King's Bench Div. whether there shall be T. by jury or not. (*Hope v. G. W. Rly.*, 1937). The power to order a jury is used sparingly; but if either party applies not later than four days after notice of T. has been given, or, if no notice of T. is required, four days after the action has been set down for T., and satisfies the master either that a charge of fraud has been made against him or a claim in respect of libel, slander, malicious prosecution, false imprisonment, seduction, or breach of promise is in issue, he still has an absolute right to a jury, unless the T. will require prolonged examination of documents or accounts or any scientific or local investigation which cannot be conveniently made with a jury—in such cases, even though the master has ordered T. by jury, the judge in charge of the list may order the case to be transferred to the non-jury list whether the parties consent or not (*Mayhead v. The Hydraulic Hoist Co.*, 1931). A T. will not be held with a jury in the Chancery Div. but if the issues are such that one of the parties is entitled and insists on a jury, as it seems that he can, the action will be transferred to the King's Bench Div. Where a jury is ordered either party may insist on a special jury (*see* UNDER JURY). Co. court actions may be tried before a judge and jury of eight men, or before a judge alone (*see* COUNTY COURT, INFERIOR COURT). The right to begin at a trial depends upon the mode of raising the issues on the pleadings so far as actions for debt or liquidated (*i.e.* certain or fixed) damages are concerned. The plaintiff will ordinarily begin in order to substantiate his affirmative pleas, but the defendant may gain the right if his defence contains none but affirmative pleas. In actions for unliquidated actions (which, generally speaking, include all those in which parties can demand a jury as of right) the plaintiff is always entitled to begin irrespective of whether the burden of proof lies upon the defendant. The right is a formidable one in a jury

action, as the 'last word' (unless the other party calls no witnesses) rests with him who begins. It is a right of no great value where the judge sits alone. For the rules of evidence at a T. and the difference between examination-in-chief, cross-examination, see *under* EVIDENCE, EXAMINATION, and LEADING QUESTION. An application for a new trial may be made on sev. grounds: e.g. misdirection by judge, misreception of evidence, misbehaviour of the jury, excessive damages. Such application is made by notice of motion to the Court of Appeal within eight days after the T. Criminal Ts. in England at assizes (including the Central Criminal Court) and quarter sessions are held before a judge and jury. Petty offences are tried before a bench of justices of the peace or a stipendiary magistrate. See W. B. Odgers, *Principles of Pleading and Practice* (13th ed.), 1946; and Sir W. Ball (ed.), *Annual Practice of the Supreme Court* ('The White Book').

**Trial by Combat, or Wager of Battle.** This mode of trial, which was introduced into England by the Conqueror, was resorted to in civil actions, 'appeals' of felony, and cases before the Court of

of a murdered person 'appealed' (meaning in this sense accused) the supposed murderer, the latter, where the accused was not a woman, child, priest, or infirm person, could claim T. by C. with his accuser. The accused was hanged if vanquished, but if he killed his accuser or prolonged the fight from sunrise till dark he was acquitted. From the twelfth century onwards, T. by C. was repeatedly condemned by the Church, notably by the Lateran Council in 1215, and gradually fell into disuse as the belief of the medieval lawyer in the rationality of law gained popular hold. Owing to the principle of Eng. jurisprudence that no law can be abrogated by mere desuetude one Abraham Thornton, accused of murder in 1847, revived this archaism of chivalry and challenged his accuser to T. by C. The 'appellant' declined, and Thornton had perforce to be discharged. T. by C. was then hastily abolished by statute.

**Triangle**, percussion instrument consisting of a simple steel bar in three-cornered form. It is struck with a short steel rod and produces a bright tinkling sound of no definite pitch.

**Triangulation**, see *under* SURVEYING AND LEVELLING.

**Trianon, Treaty of**, between the Allies and Hungary, signed June 4, 1920, at the Grand Trianon, a building in the park of the palace of Versailles, France. The principal effect of the treaty was to reduce considerably Hungary's ter. The N. portion went to Czechoslovakia and the S. to Yugoslavia, whilst Hungary retained the middle portion. The Covenant of the League of Nations forms part of this treaty as in the case of the treaty of Versailles (*q.v.*). The independence of Czechoslovakia and the Kingdom of the Serbs, Croats, and Slovenes was recognised. The independence of Hungary was made inalienable otherwise than with the consent of the League of Nations. Hungary renounced all claim over ter. outside Hungary which formerly belonged to Austria-Hungary. See A. Betzevitzky, *The Treaty of Trianon and Disarmament* 1928.

**Triarii**, see *under* ROMAN ARMY.

**Triassic System**, in geology, is the first of the three rock systems of the Mesozoic period. It constituted the upper half of the original New Red Sandstone before the elimination of the lower half as the Permian (*q.v.*) or Dyassic system. The system shows three distinct lithological types, viz.: (1) the marine facies of the Alpine Trias; (2) the semi-marine and semi-continental facies of the Ger. Trias; and (3) the continental facies of Great Britain, S. Africa, etc. The three members of the original Ger. T. system were named Bunter or variegated sandstones, Muschelkalk or shelly limestone, and the Keuper or marly beds. In Britain, only two members of the series are developed, the Bunter and the Keuper, and the system attains its greatest development in Cheshire and Warwickshire (about 2000 ft. thick). The Bunter or Lower Trias is made up of the Upper and Lower varie-



British Museum

#### TRIAL BY COMBAT (FIFTEENTH CENTURY)

The guilty man is indicated by a black bird (symbolising evil) hovering over his visor

Chivalry. In civil cases, to avoid the possible loss of one of the parties, the duel was fought by hired champions, but in military cases the parties themselves fought until one was slain or gave in (when he was put to death unless the king intervened). Where the blood relations

gated sandstones with the intermediate pebble beds, and the Keuper or Upper Trias consists of the Keuper marls and waterstones. The Bunter and Keuper are practically barren of fossils, but the latter affords beds of gypsum and rock salt as well as building stone. A large part of Germany is occupied by Triassic rocks, the Bunter affording beds of dolomite and the Keuper local seams of coal (Lettenkohl) and beds of gypsum. The middle member of the Ger. Trias (the Muschelkalk) is very rich in fossils. The Brit. and Ger. Trias were probably laid down in irregular basins, and the Muschelkalk of Germany must have been formed when the waters of the Ger. basin were in communication with the open sea. The grand development of the marine facies of the Triassic in the E. Alps consists of thick bedded limestones, dolomites, and calcareous shales. The system here is generally divided into four subdivisions, viz. the Alpine Bunter, the Alpine Muschelkalk, the Norian, and the Carinthian, none of which can be individually correlated with the Ger. types, although the range in time is equivalent. The transition beds between the Trias and the Lias (the Alpine Rhaetic beds) can be paralleled with the Rhaetic or Penarth beds of Britain. These beds are very fossiliferous, and are sometimes designated 'Avecula Contorta' beds. The Alpine or marine type of Trias recurs in the Balkans, Apennines, Peru, Himalayas, Alaska, and Japan. The continental type of Triassic occurs in S. India, S. Africa, and in part of N. America. The life of Triassic time was rich and varied. The animals include fishes (Dipnoids), amphibia, and all classes of reptiles. Pecoeteria, conifers, and cycads represented the plant life of the time, and the invertebrata embrace all classes. Lamellibranchs, gastropods, cephalopods, and crinoids were most abundant, and the Muschelkalk is rich in their remains.

**Tribe**, group of barbarous clans under recognised chiefs. In Rom. hist the word denotes each of the political divs. of Roms., originally three in number, probably representing clans, and ultimately numbering thirty-five (see GENS); also any similar div. whether of natural or political origin, e.g. the Israelites were divided into twelve Ts., descendants of the sons of Jacob (the ten Ts. were these Jewish Ts. without Judah and Benjamin, and the 'lost tribes' were the ten Ts. after deportation by Shalmaneser (see LOST TRIBES)). There were also Ts. among the anc. Gks. The Amer. Indians are divided into Ts. to-day (see AMERICAN INDIANS). To-day the word tribe is chiefly associated with tribal organisation in Africa, especially in the tropical African dependencies. The study of African reactions to European culture in such matters as marriage, inheritance, the private ownership of land (see LAND TENURE, PRIMITIVE OR COLONIAL), and the sanctions for law and order, is perhaps the most important aspect of social anthropology in Africa to-day. See also AFRICA, *Social Anthropology*; and under

race names BANTU, HOTTENTOT, KIKUYU, MASAI, etc., and under the names of individual tribes, such as GALLAS, NILOTES, NUER, NUPE, SHILLUK. See also Lord Hailey, *An African Survey*, 1938.

**Tribonian** (d. A.D. 545). Byzantine jurist and official (questor), b. in Paphlagonia. He superintended the compilation of the *Pandects, Institutes*, and new code of Justinian.

**Tribromomethane**, see BROMOFORM.

**Tribune** (Lat. *tribunus*), name given to officers of various descriptions in the constitution of anc. Rome. Of these the most important were the *tribuni plebis*, or Ts. of the commons. At first their power was small and they were only two in number, but soon they became formidable and not only preserved the rights of the people, but could summon assemblies, propose laws, stop the consultations of the senate, and even abolish its decrees by their vote. Their consent was also necessary for the confirmation of the *senatus consulta*, and if any irregularity happened in the State their power was almost absolute, for they could even imprison a consul if he acted so as to disturb the peace of Rome. Again, their persons were held sacred, and to interrupt them while speaking was a punishable offence, while to strike them was a crime. But their power was undermined by Sulla. Pompey and Cotta, however, restored their privileges and the office remained in full force until the time of Augustus, who conferred the power and office upon himself to make himself more absolute. It was totally abolished by Constantine. The fixed number of Ts. was ten. Amongst other officers bearing the title were: (1) The *tribuni militum*, who commanded a division of the legions. (2) The *tribuni cohortium praetoriarum*, who were entrusted with the person of the emperor. (3) The *tribuni aerarii*, who kept the money to defray the expenses of the army. These latter were abolished by Julius Caesar, but re-established by Augustus, who added to their number. (4) The *tribuni roborum*, who had charge of the amusements which were prepared for the people.

**Trichinopoly**: 1. Dist. of Madras, India, with an area of 4935 sq. m. and a pop. of 2,194,000. 2. Cap. of the above dist., stands on the Cauvery R. It is a fortified town, encircled by walls, and its inhab. are noted for their manuf. of jewellery, cutlery, and cigars. Here is a celebrated temple. Pop. 159,600.

**Trichinosis**, or **Trichiniasis**, disease caused by the presence of the parasitic nematode *Trichina spiralis*, which is found chiefly in man, the pig, and the rat, but also in the dog, cat, rabbit, etc. The parasite finds its way into man from infected pork which has not been properly cooked. The young forms are found encysted in the muscular fibres of the pig, and when the cysts reach the intestines, the solution of the calcified capsule sets free the parasites, which grow rapidly and reproduce in enormous numbers. The young trichinae then develop and bore through the intestinal walls, uldi-



mately reaching the muscles, where they become encysted by the secretion of lime salts. They are then quiescent, and can only further develop by reaching the intestines of another host. The acute symptoms of the disease are caused by the migration of the trichinae from the intestines. The early indications are nausea, fever, and loss of appetite; later on exhausting diarrhoea may occur, together with delirium, swollen eyelids, and tenderness and pain in the muscles. The most decisive symptom is a pronounced leucocytosis marked by eosinophilia (i.e. excess of eosinophilic white corpuscles in the blood). The treatment should include purgatives if the diagnosis is made in the early stages, otherwise this expedient is contra-indicated, as all efforts must be directed towards avoiding the debilitation of the patient. Preventive measures are important: meat should be regularly inspected and condemned if there is infection. The disease is now rare in Great Britain. See also NEMATODES.

**Trichloroacetaldehyde**, see CHLORAL.

**Trichlorethylene**, see under ANESTHETICS.

**Trichloromethane**, see CHLOROFORM.

**Tri-chromatic Printing**, see PRINTING and PROCESS WORK.

**Trickslite**, see FAHLUNITE.

**Tricolour**, or **Tri-coloured Spaniel**, see under SPANIEL.

**Tricuspid**, see HEART.

**Tricycle**, see under CYCLES and CYCLING.

**Tridacna Gigas**, see CLAM.

**Tridione**, drug introduced in 1945 by Lennox for the treatment of epilepsy (*q.v.*) Good results have been claimed for it in that variety of epilepsy known as *petit mal*; for *grand mal* phenobarbitone and related substances are preferred. The use of T. involves certain risks, such as the development of skin rashes and disorders of vision, and its administration should therefore be properly supervised. See *British Med. Jour.* Vol. 2, p. 325, 1949.

**Tridolin**, see TRIDOLIN.

**Triennial Acts**. The object of these Acts, passed in 1641 and 1694, was to ensure the frequent meeting of Parliament. Charles I ruled for eleven years without summoning a Parliament; the result was that the Long Parliament passed the first Triennial Act, 1641, empowering the Chancellor, or in default the Peers, to issue the necessary writs, if the king failed to call a Parliament for three years, or in the last resort, allowing the electors to proceed to choose their representatives. The Act was repealed in 1664 by an Act which provided that Parliament must not be interrupted for more than three years. In 1694 William III. assented to the second Triennial Act, which followed upon the declaration in the Bill of Rights that 'Parliament ought to be held frequently.' In 1716 the triennial limit was increased to seven years. That period was reduced to five years by the Parliament Act, 1911.

**Trier** (Fr. *Trèves*), city in the Rhineland Palatinate, Germany, 48 m. from Metz, on the Moselle, situated in a fertile valley shut in by vine-clad hills. It was formerly

the cap. of an archbishopric and electorate of the empire, and is now the seat of a Rom. Catholic bishop. It contains more important Rom. remains than any other place in Northern Europe, notably the picturesque ruins of the Imperial Palace; the Porta Nigra, or Rom. gate, part of the ancient defences of the town; the basilica or Palace of Constantine, now an evangelical church; baths, and an amphitheatre. Before the Second World War T. had trade in wines and manufactured machinery. Other industries were tanning, dyeing, glass-painting, and the making of furniture and pianos. T. claims to be the oldest town in Germany. It was important as early as the first century, and during the third and fourth centuries was frequently the residence of the Rom. emperors. In the Second World War it fell to Gen. Patton's Third (Amer.) Army on March 2, 1945, during the preparations for that Army's subsequent advance to the Rhine. Two-thirds of T. was destroyed, including the cathedral, the oldest in Germany, dating back to the fourth century, and several medieval churches. The Rom. baths and amphitheatre, and many fine eighteenth-century buildings, were badly damaged.

**Trieste** (anc. *Tergeste*), seaport formerly of Italy, and earlier the prin. seaport of Austria-Hungary, situated on the Gulf of T., at the N. extremity of the Adriatic, 70 m. E.N.E. of Venice. It consists of a new town and an old town. The Via del Corso separates the two portions of the city which is also intersected by the Maria Theresa Canal. The city is the see of a bishop and the prin. port of the Adriatic, having a great commerce in the produce of the Levant. Shipbuilding is an important industry, and there are naval and other dockyards; also an aerodrome and observatory. The prin. manufs. are leather, wax, and soap; iron-founding is carried on. The prin. articles of export are wool and woollen goods, sugar, paper, machinery, etc., and the imports include cotton and cotton goods, coffee, coal, hides, fruit, cereals, and tobacco. The harbour is a fine one, and has been developed and extended.

T. was estab. as a Rom. colony by the name of Tergeste in the time of Vespasian. In the thirteenth and fourteenth centuries it was under the gov. of Venice, and submitted to the Austrian suzerainty in 1382. From 1797 to 1805 it was held by the Fr., and from 1809 to 1813 was part of the Illyrian provs. T. was proclaimed an imperial city in 1849. Always a centre of Italian patriotism, it was ceded to Italy in 1918. At the close of the Second World War Marshal Tito (*q.v.*) tried in vain (June 1945) to forestall an international decision as to the future of the area, by ruling the area under a Yugoslav military gov. instead of an allied military gov. T. presented great difficulty because it is largely It. in pop. and is a port of wide international concern, serving a large part of Central Europe. Most of the disputed ter. of the Julian March was already (1945) part of Italy and had been so since the early years after the First

World War. Economically T. is of more importance to the Balkans than to Italy, but against that must be set its development of shipyards, oil refineries, and irrigation works.

The inauguration of the little state of Trieste (*Topolina Stato*, as the Its. call it) in Sept. 1947 following the peace treaty with Italy (Feb. 10, 1947) was accompanied with a threat of serious disorder. A column of Yugoslav lorries of troops appeared at one frontier post announcing their intention to march on T. It was faced by a platoon of allied troops under a Brit. maj.-gen. with orders not to allow the Yugoslavs to pass. The latter retired and all remained quiet, with the Brit. and Amers. occupying the zone stretching from Duino through T. to Muggia, and the Yugoslavs the zone from Muggia to Cittanova. Each country's garrison numbers 5000 soldiers. The Free Ter. of T. thus inaugurated is governed under a Provisional Statute until the United Nations decide that the Permanent Statute may be brought into effect. But after laboriously constructing a Free Ter. on paper at the Peace Conference the three W. Powers soon realised that this would not work in practice. Hence, in March 1948 the govs. of Britain, France, and the United States proposed that the clauses of the treaty concerning T. should be scrapped and a protocol added restoring the whole of the ter. to It. sovereignty. This remained their policy in 1950, but had not been implemented.

The Yugoslav zone is 197 sq. mi. of the Ter.'s total 293 sq. mi. and has a coastline of 53 mi. Its pop. consists mostly of the inhab. of the Venetian-built towns along the coast, with some farmers in the interior. The urban folk are all It., while the peasants are a mixed group of Its., Croats, and Slovenes. The fourth anniversary (1949) of allied military gov. in T. coincided with the first administrative elections to be held since 1922. An entire generation of Triestines had grown up since that time, a generation for whom even the mechanics of a secret and direct vote were a mystery. It is therefore to the credit of the Allied administration that an orderly and representative election was held in 1949, notwithstanding the activities of the Communists. The Christian Democratic party received wide support in these elections and were closely followed by a coalition list of the Common Man's party, the Monarchist party, and a group of nationalistic associations.

T. still remains the most convenient outlet for countries of central Europe, although the rigid Communist economy of these countries offers little scope for trade, especially since the economic sanctions (q.v.) of the Cominform induced the satellite countries, (Czechoslovakia and Hungary, to avoid Yugoslav ports. In 1948-49, however, the port was working at full capacity and the 1948 turnover amounted to 2,764,000 metric tons as against 3,380,000 during the peak year of 1938, though these figures included one million tons of (European Recovery Plan

supplies to Austria. The real economic problem of T. is its large unemployed or temporarily employed middle class, which before the Second World War worked in the forwarding agencies, warehouses, insurance offices, etc. Some efforts are being made to revive shipbuilding, and progress has been made in public works, notably in housing. The gov. have constructed the first trunk of a super-highway which will link Paris with Istanbul and T. with Vienna. But statistics of E.C.A. (Economic Co-operation Administration) grants show that T. is by no means a viable entity, either politically or financially.

**Trifolium**, genus of leguminous plants which includes those collectively known as clover (*q.v.*) and shamrock (*q.v.*).

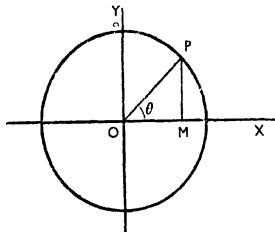
**Triforium**, in Gothic architecture, the space between the top of the vaulting and the clerestory windows, when opened into the nave by a number of arches, three or less in each bay.

**Trigonometry**, in its primary meaning, signifies the measurement of triangles; it has a much wider scope, however, embracing all types of geometrical and algebraical investigations by means of certain quantities termed trigonometrical ratios. These ratios are defined as follows. Take any system of rectangular axes OX, OY, and with centre O describe a circle of any radius. On its circumference take any point P. Join OP, draw PM perpendicular to OX. Then the co-ordinates of P are (OM, MP), or in ordinary Cartesian notation (*x*, *y*), where *x* = OM, *y* = MP. If the angle POM be denoted by  $\theta$ , then  $\sin \theta = \frac{MP}{OP}$ ,  $\cos \theta = \frac{OM}{OP}$ ,  $\tan \theta = \frac{MP}{OM}$ ,  $\csc \theta = \frac{OP}{MP}$ ,  $\sec \theta = \frac{OP}{OM}$ ,  $\cot \theta = \frac{OM}{MP}$ . The terms sin, cos, etc., are abbreviations for sine, cosine, tangent, cosecant, secant, and cotangent. From the above definitions the following relations hold:  $\sin \theta = \frac{1}{\csc \theta}$ ,  $\cos \theta = \frac{1}{\sec \theta}$ ,  $\tan \theta = \frac{1}{\cot \theta}$ . Also since OMP is a right-angled triangle,  $MP^2 + OM^2 = OP^2$   $\therefore \left(\frac{MP}{OP}\right)^2 + \left(\frac{OM}{OP}\right)^2 = 1$ , i.e.  $\sin^2 \theta + \cos^2 \theta = 1$ . From these, other relations, such as  $\sec^2 \theta = 1 + \tan^2 \theta$  and  $\csc^2 \theta = 1 + \cot^2 \theta$ , may be deduced. In the construction of tables for the values of the different trigonometrical ratios of  $\theta$ , the labour of finding these values is greatly minimised by the use of the following relations, it being only necessary to calculate those values as  $\theta$  takes the various values from  $0^\circ$  to  $45^\circ$ . These relations may easily be proved by reference to the

diagram,  $\sin (90^\circ - \theta) = \frac{OM}{OP} = \cos \theta$   
 $\cos (90^\circ - \theta) = \frac{MP}{OP} = \sin \theta$ ,  $\tan (90^\circ - \theta) = \frac{OM}{MP} = \cot \theta$ . The following also may easily be deduced:  $\sin (90^\circ + \theta) = \cos \theta$

$\cos(90^\circ + \theta) = -\sin \theta$ ;  $\sin(180^\circ - \theta) = \sin \theta$ ;  $\cos(180^\circ - \theta) = -\cos \theta$ . Thus  $\cos 170^\circ = \cos(90^\circ + 80^\circ) = -\sin 80^\circ = -\sin(90^\circ - 10^\circ) = -\cos 10^\circ$ .

The addition theorem is useful in finding the values of the functions of the sum or difference of two angles, the values of these functions for each angle being known.  $\sin(\theta + \phi) = \sin \theta \cos \phi + \cos \theta \sin \phi$   
 $\cos(\theta + \phi) = \cos \theta \cos \phi - \sin \theta \sin \phi$   
 $\tan(\theta + \phi) = (\tan \theta + \tan \phi)/(1 - \tan \theta \tan \phi)$



For differences, write  $-\phi$  for  $+\phi$  in the above, and note that  $\sin \phi = -\sin -\phi$ ,  $\cos \phi = \cos -\phi$ ,  $\tan \phi = -\tan -\phi$ . Often an angle is denoted by its trigonometrical ratio; thus value is called the inverse function, e.g.  $\sin^{-1}\frac{1}{2}$  is the angle whose sine is  $\frac{1}{2}$ ,  $\cos^{-1}\frac{1}{2}$  is the angle whose cosine is  $\frac{1}{2}$ . For the construction of tables, the sine and cosine functions are expanded into the following series:

$\sin \theta = \theta - \frac{\theta^3}{3!} + \frac{\theta^5}{5!} - \dots$  ad inf.,  $\cos \theta = 1 - \frac{\theta^2}{2!} + \frac{\theta^4}{4!} - \dots$  ad inf., where  $\theta$  is measured in radians. Thus if  $\theta^\circ$  is value of the angle in degrees, the number of radians  $= \frac{\pi \theta^\circ}{180^\circ}$ . Trigonometry is applied to the solution of triangles. These triangles may be plane or spherical; the chief relations existing between the sides and the trigonometrical ratios of the angles are:  $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ ,

$a^2 = b^2 + c^2 - 2bc \cos A$ , etc., where A, B, and C denote the angles, and a, b, c the sides opposite to these angles. In spherical triangles  $\frac{\sin A}{\sin a} = \frac{\sin B}{\sin b} = \frac{\sin C}{\sin c}$ ,

$\cos a = \cos b \cos c + \sin b \sin c \cos A$ ; the A, B, C, and a, b, c having the same significance as before. The subject arose out of the study of astronomy, the Gk. astronomer Hipparchus (160 B.C.) inventing it. The man who greatly extended the subject was Ptolemy, the Alexandrian astronomer. Regiomontanus made the subject a science quite independent of astronomy. See Todhunter, *Plane Trigonometry*, 1903; Todhunter and Leathem, *Spherical Trigonometry*, 1907; J. A. Bullard and A. Kiernan, *Plane and Spherical Trigonometry*, 1923; T. M. MacRobert and W. Arthur *Trigonometry*, 1937-38; A. Page, *Trigonometry*, 1949.

**Trihydroxypropane**, see GLYCERINE.

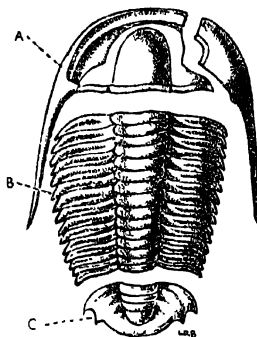
**Tri-iodomethane**, see IODOFORM.

**Trikkala**, tn. of Greece, cap. of the prefecture Trikkala, 38 m. S.W. of Larissa. It is a centre of trade in wheat, maize, tobacco, and cotton, and the see of an archbishop. Pop. prefecture 256,200; tn 23,000.

**Trilene**, see under ANÆSTHESIA.

**Trillium**, genus of perennial plants (family Liliaceæ), with thick rhizomatous stems and roots, and a solitary nodding white, pink, or purple flower borne in the centre of a whorl of three leaves. *T. grandiflorum*, the wake robin, is often grown in gardens.

**Trilobites**, in palæontology an order of Crustacea, which are now regarded as an early type from which the living and more specialised Isopoda have arisen. The body is more or less distinctly trilobate (hence the name T.) in a longitudinal direction; there is a cephalic shield, generally with a pair of sessile, compound eyes; the thoracic somites are moveable upon one another, and vary greatly in number; the abdominal segments coalesce to form a caudal shield (pygidium), and there is a well-developed upper lip (hypostome) formed by a doubling of the headshield. Each of the segments (except the last) bear a pair of appendages, though these are not usually preserved. The Ts are exclusively Palæozoic and range from the Upper Cambrian to the Lower Carboniferous of Europe and America.



A TRILOBITE (DORSAL VIEW) DISSECTED TO SHOW CHIEF POINTS OF THE ANATOMY

A, head; B, thorax;  
C, caudal shield (pygidium) of abdomen

attaining their maximum in the Silurian. There are over 500 species known, distributed in many genera, which are further subdivided into some twenty main families.

**Trilogy**, group of three tragedies which are either connected by a common subject, or each is a distinct story. In Greece everyone who took part in the poetic contest had to produce a T. and a satiric

drama. The only surviving example is the *Oresteia* of Æschylus, consisting of the 'Agamemnon,' 'Choephore,' and 'Eumenides.'

**Trim**, cap. of Meath, Eire, on the R. Boyne. Its chief points of interest are its ruined castles and abbey and a monument to the duke of Wellington, once a resident. Pop. 1500.

**Trimethylamine**, see AMINES; ETHYL-AMINE.

**Trimintain**, see BOSTON (Massachusetts)

**Trimorphism**, see DIMORPHISM.

**Trimurti**, in Indian religion, the later Hindu triad (*q.v.*), Brahma, Vishnu and Siva, considered as an inseparable unity. T. implies the unity of the three principles of creation, preservation and destruction, and is an expression of philosophical, rather than popular belief. The symbol of the T. is the mystical syllable *o* ( $= a + u$ ) *m*, where *a* stands for Brahma, *u* Vishnu, and *m* Siva. T. as the representation of the Hindu triad consists of one human body with three heads, that of Brahma in the middle, that of Vishnu at the right, and that of Siva at the left.

**Trinacri**, see SICILY.

**Trincomalee**, seaport on the N.E. coast of Ceylon, with an excellent harbour. It is the site of the Temple of the Thousand Columns, a pilgrimage resort, reduced to ruins by the Portuguese during the seventeenth century. It was the chief Brit. naval base in Ceylon during the Second World War. Pop. 20,000.

**Tring**, market tn. of Hertfordshire, England. Here are Tring Park and the Rothschild zoological museum. There is a trade in agric. produce. Pop. 5100.

**Trinidad**, the second largest W. Indian is. belonging to Britain, situated at the extreme S. of the chain of W. Indian is., immediately opposite to the delta of the Orinoco R., and lying between 10° 3' and 10° 50' N. lat. and 60° 55' and 61° 56' W. long. It is 4005 m. by sea from London and 1958 m. from New York. T. is rectangular with promontories at the four corners, those at the N.W. and S.W. being extended towards the mainland of S. America of which, geologically, it is a part, and enclosing the Gulf of Paria, which is practically a land-locked sea between T. and Venezuela, with narrow straits at the N. and S. The Straits at the N. are called Bocas del Dragón or Dragon's Mouths and those at the S. the Boca de la Serpiente or Serpent's Mouth. It has an area of 1863 sq. m.; its average length is 50 m. and breadth, 37½ m. The N.E. and S. coasts are steep and lofty, with few harbours, but on the W. the coast is low, rising gradually towards the interior, with fertile plains, hills, and valleys. The N. coast is much indented, but most of its bays are rock-bound excepting those of Maracas and Las Cuevas. The E. coast, being exposed to the Atlantic, is often unapproachable by shipping, and on the S. coast the bays of Erin, Quinam, Moruga and Guayaguayare are so shallow that vessels have to lie well off the shore. Three mt. ranges traverse the is. from E. to W. Between the N. and the Central ranges the country is flat and well

watered, but the land to the S. of the Central range is undulating and the water supply poor. The three most important and navigable rivs. are the Caroni, which drains the N.W. portion of the is., the Ortoire or Guaytare, which drains the S.E. section, and the Oropouche draining the N.E. Other rivs. are the Lebranche, Nariva and Guaycare. The climate is tropical yet not too warm.

Agriculture and oil production are the chief occupations. An agric. dept. with a highly trained technical staff, the Imperial College of Agriculture, founded in 1921, and a recently established microbiological laboratory, keep the colony abreast of the latest discoveries tending to the improvement of its soil and flora. The chief agric. products are:—sugar, coconuts, and cocoa. Other crops are citrus fruits (lime, grapefruit, and oranges), coffee (both robusta and arabica), rubber, and tonka beans. T. is the source of Angostura bitters, the manuf. of which was transferred to the is. from Angostura or Ciudad Bolívar in 1873, owing to the troubled state of Venezuela. The prin. mineral products are crude petroleum (output for 1947 was 20,232,500 barrels), asphalt (output \$7,300 tons), building stone, and road metal. One of the features of the is. is Lake Brea or the pitch lake, which contains an enormous supply of asphaltum. The lake occupies 114 ac. Oilfields are being developed, and the is. is now the second largest producer of petroleum in the Commonwealth. The prin. exports (1947) were petroleum, asphalt by-products, cocoa, sugar, and rum. The total trade of the colony amounted in 1947 to \$205,898,200 as compared with \$86,201,000 in 1939.

In 1949 150,000 tons of sugar were manufactured, representing one-tenth of the weight of the cane grown. The oil industry contributes directly and indirectly some 40 per cent of the gov.'s revenue. The cocoa grown in T. is the best in quality in the world. Coconuts and products of coconuts are a valuable subsidiary industry. Secondary industries include the manuf. of beer, glass, and matches. T. is reasonably stable and prosperous, the budget for 1950 balancing around \$45,000,000 (about \$9,000,000). There exist, however, poverty, some unemployment, disease, and an acute housing shortage. The overall pop. is about 500,000 (including Tobago, 30,000). Of these some 50 per cent are W. Indian, i.e. of W. African origin; there are about 200,000 E. Indians (mostly Hindus, but with large Christian and Muslim sections among them); the remainder are chiefly of Brit., Fr., Sp., and Portuguese descent, as well as Chinese, Syrians, Jews, and others (the pop. of Tobago is mostly W. Indian).

In 1946 universal adult suffrage was introduced, thereby increasing the electorate from 30,000 to 250,000. The present constitution, which came into force early in 1950, provides, as did its predecessor, for single-chamber gov. only; it is both experimental and transitional, being a long stride towards full self-gov.

within the framework of the Brit. Empire and Commonwealth. The legislature or legislative council consists of three *ex officio* members (the colonial secretary, attorney-general, and financial secretary), five members nominated by the governor, and eighteen elected members. The chairman is a stipendiary speaker appointed by the governor, who is not himself a member of the legislature. The cabinet or executive council (the resemblance is not exact), consists of the governor as chairman, the same three *ex officio* members as in the legislature, one nominated member, and five elected members elected by the legislature—the elected thus being in a majority of five to four. The governor has a casting but not an original vote. Elected members hold ministerial or quasi-ministerial portfolios, being political heads in charge of selected depts., assisted by the civil service. The three *ex officio* members also hold portfolios. The executive council is advisory only. The council, however, is the chief instrument of policy and in all ordinary circumstances the governor is obliged to act upon its advice.

Co. councils were estab. in 1946, the chairman of each council being elected member on the legislature of the colony (there are eight counties). There are 261 primary and intermediate schools in the colony including both gov. and assisted schools. The majority of the latter are R.C., Church of England, and Canadian Presbyterian. Queen's Royal College and its affiliated institutions, St. Mary's College in Port of Spain, and Naparima College and St. Benedict's in San Fernando afford facilities for the higher education of boys. St. Joseph's Convent and other schools provide similar education for girls. The Supreme Court of T. is a superior court of record and consists of a chief justice and four puisne judges, and its jurisdiction is assimilated as nearly as possible with the practice and procedure in the High Court of Justice in England so far as not displaced by local rules of court. There are also petty civil courts in various parts of the colony and magistrates' courts.

There are 1068 m. of main and 1285 m. of local roads. There is a gov. railway of 118 m.: one line runs through St. Joseph and Arima to Sangre Grande and passes through some of the cacao dists., affording fine views of the Central Range of mts. Three wireless stations are maintained by the gov. Under an agreement concluded March 27, 1941, defence bases have been leased to the U.S. Gov. for a period of 99 years. There is a civil airfield at Piarco and an emergency landing field at Toco (N. Trinidad). A broadcasting station erected at Caroni was inaugurated in 1947. Port of Spain (*q.v.*) (pop. 107,500), the cap., has many modern amenities. Other important tns. are San Fernando and Arima.

*History.*—T. was discovered by Columbus on his third voyage, in 1498 and taken possession of by him for the king of Spain. He named it La Trinidad or 'The Trinity.' Columbus never came to T.

again and the Spaniards made no attempt to found a settlement for over thirty years. The aboriginal Arawak Indians called the is. 'Iere' or 'The Land of the Humming Bird,' a name by no means inappropriate until recent times. For almost two centuries after the discovery of T., the is. remained as undeveloped as it was before the advent of Columbus, a prey to internecine strife between the fierce Caribs and the milder mannered Arawaks and to the cruelties of the Spaniards in quest of mythical gold. Sir Robert Dudley (or Dudley) (styled duke of Northumberland and earl of Warwick) with Captain Munck, sailed to Cedros Bay in 1595 but, growing tired of waiting for Sir Walter Raleigh, whom he expected to meet in T., he sailed for the Orinoco. Ten days later Raleigh sailed into Cedros Bay and up to Lake Brau (which he describes in his *Discoverie of Guiana*, Hakluyt series). In T., he learned that the Sp. governor intended to cross to Guiana in quest of El Dorado. Unwilling to leave a Sp. garrison in his rear, he hurled his force on the Sp. Corps du Guard, put them to the sword, and sacked the little tn. of San Josef de Oruna. In the seventeenth century T. was twice raided (1640, 1677) by the Dutch and, in 1690 by the Fr rivalry among the chief maritime powers, being at its height. These raids had some unifying effect on the activities of the inhab., for despite the mercantilist policy of the Sp. gov., there was a considerable growth of trade (especially in 1695). Towards the end of the seventeenth and the first decade of the eighteenth centuries cocoa was successfully cultivated in T., but a blight destroyed the plantations (c. 1725) and T. made little further progress until 1785, when a royal proclamation was issued, by which extraordinary advantages were offered to foreigners of all nations to settle in T., on condition that they were Rom. Catholics. The result was a large influx of pop., which was soon augmented by many Fr. families who were driven from St. Domingo (*q.v.*), Haiti (*q.v.*), and elsewhere in consequence of the Fr Revolution. To this cause is to be traced the preponderance of the Fr. element in a colony which never (like, e.g. St. Lucia) belonged to France. On Feb. 18, 1797, articles of capitulation were signed by the Sp., by which England's sovereignty over the is. was recognised. The final cession of the colony took place in 1802 under the Treaty of Amiens.

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**Trinidad.** 1. City on the S. coast of Cuba, 175 m. S.E. of Havana, and 45 m. by rail from Santa Clara through beautiful scenery. It is an interesting old tn., founded in 1514, and the dwelling-house of Cortés, when he was alcaide of Santiago de Cuba, is still in existence. T. exports sugar and honey. Pop. 14,500. 2. Tn. of Bolivia, in Beni Prov., of which it is the cap., 265 m. N.E. of Cochabamba. It is a few m. from the Mamore R. in a hot malarial region and is one of the most important trading centres in N.E. Bolivia, in an area producing cotton, cacao, sugar, and cattle. Pop. 15,000.

**Trinitarians**, or **Redemptionists**, Fr. religious order founded by John of Matha and Felix of Valois for the redemption of Christians captive among infidels. The T. were founded in 1198 and followed the rule of St. Augustine.

**Trinitro-phenol**, see **PICRIC ACID**.

**Trinitrotoluene**, 'T.N.T.', highly explosive,  $C_7H_5(NO_2)_3$ , largely used in the World Wars. It is a pale yellow crystalline solid, m.p.  $81^\circ C$ , prepared by acting upon toluene (q.v.) with a mixture of concentrated sulphuric and nitric acids.

**Trinity**, in theology, the term used for the highest mystery of the Christian faith, the doctrine that God, while being one in nature, is three distinct persons, viz. the Father, the Son, and the Holy Spirit. In the O.T. this doctrine cannot be said to hold a prominent place, for the Jews had to learn the unity of God as opposed to polytheism. In the N.T. we learn of the Son of God who is divine and of a third Person to whom divine attributes are given. The three persons are grouped in the formula of Matt. xxviii., 19; 'Baptising them in the name of the Father and of the Son and of the Holy Ghost.' The development of these data was the work of the early centuries, and the clear expression of the doctrine was the work of Gk. thought. The Christological problem was first discussed, and the original Nicene Creed ended at the words 'And I believe in the Holy Ghost.' In the W. the great exponent of the Trinitarian doctrine is Augustine of Hippo. The fullest expression, however, is found in the *Quicumque Vult*, the so-called Creed of St. Athanasius. See **HOLY SPIRIT** OR **HOLY GHOST**.

**Trinity**, see **JAN MAYEN ISLAND**.

**Trinity College, Cambridge**, was founded in 1546. Henry VIII. is in a real and vital sense the founder of the college, for he fused Michaelhouse (founded 1324) and King's Hall (founded 1337) into a single great college, increased their joint endow-

ments fourfold, and gave his creation a new dedication and a new name. Of these two colleges it was rather King's Hall than Michaelhouse which formed the model and nucleus of Trinity. The last warden of King's Hall became the first master of T. C., and many of its fellows were absorbed in the new society. T. C. was founded for a master and sixty fellows, but the endowment was considerably increased by Queen Mary. Of the existing buildings of T. C. only two prominent structures were standing in 1546. The Great Gate was, in fact, completed eleven years before Trinity was founded; the other conspicuous survivor of King's Hall is also a gate, the fifteenth-century clock-tower which Nevile (Master 1593-1615), adorned with a statue of Edward III. The prin. buildings of Michaelhouse lay to the S.W. Nevile, at the cost of some destruction of minor blocks, linked into the sides of a large irregular quadrangle four great existing structures, the Great Gate, the hall of Michaelhouse, the King's Gate, and Mary's Chapel, all of which survive excepting Michaelhouse Hall which was replaced by the Essex Building in the eighteenth century, and so do Nevile's own creations, the Queen's Gate, the Hall, the Lodge and the old Library. T. C. is the largest college in the Univ. Amongst famous members have been Bacon, Byron, Dryden, Eddington, Kinglake, Macaulay, Newton, Tennyson, Thackeray, and Vaughan Williams. See W. W. Rouse Ball, *Trinity College*, 1906.

**Trinity College, Dublin**, the univ. of Dublin was founded in 1591. The univ. consists of only one college, the head of which is the provost. It returns three senators to Seanad Éireann. Since 1903 women have been admitted to its degrees. Parliament Square and Library Square contain the chapel, examination hall, dining hall, and library with its very valuable collection of Irish MSS. including the Book of Kells. T. C. has a botanic garden at Ballsbridge. The proportion of famous Irish names upon the rolls of the College is remarkable, and includes names of poets, satirists, novelists, orators, scientists, historians, publicists and politicians of every party.

Among the famous names connected with the college are Adam Loftus (archbishop of Dublin), Sir Wm. Cecil James Cusker (archbishop of Armagh), William Congreve, Henry Farquhar, Thomas Moore, Oliver Goldsmith, Thomas Southorne, Philip Francis (translator of *Horace*), Thomas Parnell (poet), Edmund Maloué (the editor of Shakespeare), Henry Brooke (author of the *Fool of Quality*), John Philip Curran, Henry Grattan, Wolfe Tone, Henry Dodwell, Jeremy Taylor, William Conyngham Plunket, Henry Flood, Henry Boyle (earl of Shannon), Sir Eyre Coote, James Whitelaw (the historian of Dublin), Edmund Burke, Dean Swift, Sir William Rowan Hamilton, Bishop Berkeley, Thomas Davis, and Sir John Pentland Mahaffy.

As early as 1547 Archbishop Browne had suggested that a univ. should be erected at St. Patrick's Cathedral and

though nothing came of this scheme it was revived in 1563 by Sir William Cecil. In 1584 Sir John Perrot, the Lord Deputy, suggested that two colleges should be endowed out of the revenues of St. Patrick's Cathedral and this scheme might have gone through had it not been for the opposition of Adam Loftus, the archbishop of Dublin, who had some other plans in view. In 1590 a number of influential people including Loftus himself, the Lord Chief Justice, Henry Ussher and Luke Challoner, brought matters to a conclusion. The Mayor and Corporation of Dublin were persuaded to give the old Augustinian monastery of All Hallows, which had been granted to them at the Dissolution of monasteries in the reign of Henry VIII. Henry Ussher went to England with letters of recommendation (4 Nov. 1591) to the Privy Council requesting the Council to persuade the Queen to assent to the foundation of the college. The Queen duly granted a warrant for the erection of the college and on 3 March, 1592, it was incorporated by Charter. The Charter named William Cecil, Lord Burghley as Chancellor; Henry Ussher, archbishop of Armagh; Luke Challoner, Prebendary of St. Patrick's Cathedral; Launcelot Moine, Prebendary of Christ Church Cathedral, as Fellows. Adam Loftus was the first Provost. The college was open to all, and though it was chiefly patronised by the settlers, a considerable number of 'natives' were educated there as well for at least half a century after the foundation. It should be noted that T. C. is essentially a Protestant foundation, although many Catholics have been members of it.

**Trinity College, Oxford**, was originally founded and endowed by Edward III., Richard II., and the priors and bishops of Durham. At the Reformation it was suppressed, but a new college was founded in 1554-55 by Sir Thomas Pope. This is the present college. The original foundation was for a president, twelve fellows, and twelve scholars, these last to be chosen, if possible, from the founder's manors. Famous members have included Lord Chatham, Cardinal Newman, A. J. W. Mason, Ronald Knox, and Sir Kenneth Clark.

**Trinity Friars**, see CRUTCHED FRIARS.

**Trinity Hall**, college of Cambridge Univ., founded in 1350 by Wm. Bateman, bishop of Norwich, for the study of canon and civil law. In the eighteenth century the study of the law was still the chief intellectual activity of T. H.; but during the next hundred years, and by 1860 the extinction of the 'civilians' and the estab. of the Law Tripos had greatly modified the exclusively legal tradition of T. H.

**Trinity House**, name of five maritime societies, of which only one, the 'Corporation of Trinity House of Deptford Strond,' London, retains its ant. powers and privileges. The others, at Leith, Dundee, Hull, and Newcastle-on-Tyne, dwindled to mere benefit societies. The London House, however, still retains the manage-

ment of some of the most important interests of the seamen and shipping of England as the General Lighthouse authority for England and Wales and the Principal Pilotage authority in the U.K. Its corporation consists of a master, deputy-master, and nine elder brethren, one R.N. and eight Merchant Service, two of whom sit as Nautical Assessors in the Court of Admiralty in cases where any question upon navigation is likely to arise. There are also many younger brethren and sev. honorary elder brethren, e.g., H. M. The King, Mr. Winston Churchill, Earl Mountbatten of Burma. The T. H. of Hull began in the fourteenth century as a religious fraternity seemingly connected with a guild of shipmen, which survived the dissolution of religious guilds in 1517. The Corporation received its first Charter on 20th May, 1511, from Henry VIII. but it is clear from this document that the 'guild or fraternity' existed prior to that date.

**Trinity Sunday**, according to the W. calendars, the first Sunday after Pentecost, or Whitsunday, observed by the Rom. Catholic and Anglican Churches. The corresponding Sunday in the Gk. Church is given the name of *All Saints' Sunday*. The Anglican Church names the Sundays succeeding T. S., until Advent, *first, second, etc., Sunday after Trinity*, while the Rom. Catholic Church reckons these Sundays from Pentecost.

**Trinoda Necessitas**, duties laid upon holders of land in A.-S. England, comprising the manning of fortified places, repair of bridges, and service in the fyrd. The term 'obligations' was used in A.-S. documents: T. N. is a seventeenth-century phrase.

**Trinovantes**, peasant tribal group of non-Belgic character, who lived N. and N.E. of the Thames in the latter part of the Early Iron Age in Britain. Their culture was partly that of the native Hallstatt, influenced to some extent by that of La Tène. Caesar accepted their submission, as did Claudius in A.D. 43 who left them under Rom. suzerainty. The T. joined the revolt of the Iceni and-r Boudicca (Boadicea) and suffered as a result. Their cap. was made into the colony of Camulodunum, by Colchester.

**Triol**, composition or movement for three vocal or instrumental parts; more particularly a chamber work for three instruments, especially violin, cello, and pianoforte (pianoforte T.), or violin, viola, and cello (string T.); also the alternative section in a minuet, scherzo, march, or sometimes other kinds of movement in a sonata-form work, so called because originally such sections were by convention written in three parts.

**Triolet**, poem of eight, usually eight-syllabled, lines, only two rhymes being used, e.g. a b a a a b a b; the first line recurs as the fourth and seventh, the second as the eight or, in other words, the first and last two lines are identical and the fourth is the same as the first. The T. has been described as a condensed rondel.

**Triphenylmethane**,  $\text{CH}(\text{C}_6\text{H}_5)_3$ , is obtained by the action of benzal chloride,  $\text{C}_6\text{H}_5\text{CHCl}_2$ , on benzene, in presence of aluminium chloride; or from benzaldehyde and benzene in conjunction with zinc chloride. It forms colourless prisms melting at  $93^\circ \text{C}$ . and boiling at  $359^\circ \text{C}$ . It is the parent substance of a number of dyes. Thus by the condensation of benzaldehyde and dimethylaniline with zinc chloride, leucomalachite green is obtained (the leuco base), which, on oxidation with lead dioxide and hydrochloric acid, gives rise to the colour base (a carbinol), and this loses water to give the dye malachite green. *Crystal violet* is another example. *Pararosanine* can be made by the condensation of paratoluidine (1 molecule) and aniline (2 molecules) in presence of arsenic acid. *Rosanine* is similarly obtained from a mixture of ortho- and paratoluidines. In each case the colour base formed loses hydrogen to give the dye.

**Triple Alliances.** The first was ratified between the States-General and England against France in 1668 for the protection of the Sp. Netherlands. It was afterwards joined by Sweden, thus forming a T. A. Another was arranged in 1717 between England, Holland, and France against Spain, and after the accession to it of Austria in 1718 it was known as the Quadruple Alliance. In 1788 England, Prussia, and Holland allied, and in 1795 England, Russia, and Austria. About 1882 an alliance was arranged between Germany, Austria, and Italy to check the power of Russia and France. Although this T. A. expired in 1892, it was renewed and extended for a number of years, and this, together with the dual alliance between France and Russia and the triple entente between England, France, and Russia, was relied upon to preserve the balance of power between the great nations of the world. The T. A. was last renewed in 1912, and it bound Italy to the Central Powers in a defensive alliance. However, during the First World War Italy's initial neutrality became gradually less 'benevolent,' and eventually on May 4, 1915, Italy denounced her treaty of alliance with Austria-Hungary. *See further under ITALY; see also EUROPE; WORLD WAR, FIRST.*

**Tripoli**, seaport and city of N. Africa, cap. of Tripolitania, itself sometimes known as Tripoli. Situated on a promontory of the Mediterranean, it is a typical Moorish city, containing a Sp. fortress, many beautiful gardens, and sev. fine mosques. A notable feature is the arch of Marcus Aurelius in marble. During the It. occupation a number of modern gov. buildings were erected, together with a fort. T. is at the junction of caravan routes to Timbuktu, Lake Chad, and Darfur, and three railway lines diverge from it to Zuara, Garian, and Tagiura; it is connected by telegraph cable with Malta and Syracuse. It has a court of assize and a court of appeal. The city was repeatedly bombed by the R.A.F. in 1941-42. With its capture on Jan. 23, 1943, the Eighth Army secured

the best N. African port between Tunis and Alexandria. (*See also AFRICA, NORTH, SECOND WORLD WAR CAMPAIGNS IN*). Pop. (1938) 108,300 (Its., 39,000).

**Tripoli**, or **Tarabulus**, tn. of the Lebanon, 40 m. N.N.E. of Beirut, its port being El Mina. There are rail connections with Haifa and Homs. In 1109 T. was taken by the Crusaders. A varied trade is carried on in oranges, silk, etc. Pop. 72,000.

**Tripolitania**, or **Tripoli**, prov. of Libya, a former It. ter. of N. Africa, stretching from the Mediterranean some 800 m. into the Sahara Desert. Tunis and Algeria lie to the W., and the Libyan prov. of Cyrenaica to the E. The greater part of the coast-line is low and sandy, and thus quite unfit for harbourage. There are no rivs. of importance. The country is flat near the coast, but there are low mt. ranges in the W. centre, and S. There are fisheries for sponges and tunny along the coast, but T. is almost an entirely agric. country, possessed of no minerals but salt, which, however, is of excellent quality and produced in large quantities. Along the coast all kinds of Mediterranean fruit, palms, olives, etc. are produced. Farther inland are grown barley and wheat, olives, tobacco, mulberries, figs, almonds, dates, and the vine. There is good pastureland for cattle and sheep. It is in this part of T. that It. colonisation was thickest. Farther inland come the dunes, which, during the It. occupation were forested with poplar, pine, acacia, and robinia. Next comes the mt. dist., which produces vines, figs, and olives. The sub-desert zone, still farther inland, produces only alpha, a source of cellulose, and further S. still is the desert itself, barren save for fertile oases. Before the abolition of the overseas slave trade, the prin. commerce was in Negro slaves for the mainlands of Turkey. The chief exports are tobacco, dates, figs, olives, grapes, almonds, salt, barley, esparto grass, ostrich feathers, and sponges, and the chief imports, foodstuffs, cotton, and metal goods. There is an important caravan trade with the Central Sudan. About 144 m. of railroad are centred on Tripoli, the cap. and chief port. Other centres are Sirte, Aziez, Notlia, Misrata, Homs, and the oasis of Ghadames.

The remains of anc. Rom. houses, baths, theatres, and temples tell of the first Rom. occupation over 2000 years ago. T. then enjoyed a long period of prosperity. It was rich in grain and olive oil, and it supplied a third of the corn imported by Rome. In later centuries Arabs from the E. conquered T., bringing with them the new faith of Mohammed. During the sixteenth century T. came under Turkish rule, and in 1835 was made into a vilayet of the Ottoman empire. In Sept. 1911, however, Italy, which had long been dissatisfied with its relations with Turkey, issued an ultimatum, which was immediately followed by war. The tn. of T. was blockaded, and in the beginning of Oct. the whole ter. was annexed. This annexation was recognised by the treaty of Ouchy in Oct. 1912. T. was thereafter



until the Second World War, administered under the It. Colonial Ministry. The It. policy of energetic development met with a severe check at the beginning of the First World War, when there was a general rising of the natives. Not until the governorship of Giuseppe Volpi, 1921-25, was order thoroughly restored. In 1919 the W. frontier was fixed by arrangement with France, and in 1928 effective occupation was greatly extended. S. T. was united to Cyrenaica in 1938 to form It. Libya (*q.v.*) as it was under It. rule until 1939.

In the Second World War the Its. were driven out of N. Africa and T., like the other former It. colonies, was occupied by the Allied forces, Italy having by the peace treaty (Art. 23) renounced all right and title to these possessions, the final disposal of which remained to be determined by the Allies, Brit. administration meanwhile being estab. Pop. 600,000, of whom 40,000 are It. For the campaign of 1943, see AFRICA, NORTH, SECOND WORLD WAR, CAMPAIGNS IN; TRIPOLI.

See H. M. de Mathisieux, *La Tripolitaine d'hier et de demain*, 1913; W. K. McClure, *Italy in North Africa*, 1913; V. Mantegazza, *La Tripolitania*, 1913; F. T. Marinetti, *La Battaglia di Tripoli*, 1912; E. Carnevari, *La Tripolitania*, 1924; L. C. Ferard, *Annales tripolitaines*, 1927; G. E. Simpson, *The Heart of Libya*, 1929; R. di Lauro, *Tripolitania*, 1932; M. Moore, *Fourth Shore: Italy's Mass Colonisation of Libya*, 1940; G. Casserley, *Tripolitania*, 1913.

**Tripolite**, see KIESELGUHR.

**Tripes**, **The**, final examination for the honours degree at Cambridge Univ. The name recalls the three-legged stool (Gk. *trípous*) on which an 'old bachelour' sat when the senior bachelor for the year propounded to him two questions. The T. examination is taken in more than one subject, each course of study having two parts which may be interchanged. The first part is devised as a two-year course and the second generally as a one-year course; so that the T. may be taken in two parts over the ordinary three years' residence at Cambridge. It, however, the student takes the T. after two two-year courses, a residence of four years is ordinarily necessary.

**Triptych** (Gk. *tríptuxos*, threefold), tablet, often used as an altar-piece, of three leaves, each painted, and so constructed that the outer two can fold over the face of the central leaf.

**Tripura**, state of India, bordered N., W., and S. by E. Bengal, Pakistan. Area 4116 sq. m. Pop. 513,000. The chief tn. is Agartala.

**Trireme** (Gk. *tríremis*), chief galley of the Gks. and Romans, the favourite ship in time of war. As its name implies, it was provided on either side with three banks of oars, manned respectively by *thranites*, *zínroi*, and *thalámai*. The thranites had the longest, the thalaites the shortest oars, the latter sitting on the lowest tier. The crew numbered about 220, 174 of whom were oarsmen, and seventeen sailors.

**Trismegistus**, see HERMETIC BOOKS, and THOTH.

**Tristan**, or **Tristram**, hero of romantic Celtic legend. The scene of the story, which deals with the tragic and fateful love story of T. and the two Iseults, Iseult of Ireland and Iseult of the fair hand, is laid in Ireland and Brittany, but chiefly in Cornwall at the court of King Mark.

**Tristan da Cunha** (*d. c.* 1536), Portuguese navigator, set out on a voyage of exploration with d'Albuquerque in 1506. Besides discovering the is. which bear his name (*q.v.*), he took possession of Socotra and came home richly laden from an expedition against Calicut.

**Tristan da Cunha**, prin. of a group of is. discovered by the Portuguese navigator of that name, lying in 37° 6' S. lat. and long. 12° 2' W., some 2000 m. W. of the Cape of Good Hope. Its inhabitable area is 12 sq. m. The other is., Inaccessible, Nightingale, and Gough Is., or Diego Alvarez, are uninhabited. They are Brit. possessions, which, in 1938, were made dependencies of St. Helena. In 1915 the islanders of Tristan numbered 230, nearly all of whom were born in the is. T. is an extinct volcano (7640 ft.) with a crater lake near its summit. The inhab. have about 250 head of cattle, 750 sheep, and a stock of poultry. Potatoes are the staple diet. Fish of good quality is obtainable in plenty. For flour, sugar, etc., the is. is dependent on external assistance, and arrangements are usually made for the is. to be visited by a ship at least once a year.

T. was taken possession of by a military force during the residence of Napoleon at St. Helena. When the garrison was withdrawn in 1817 Wm. Glass, a corporal of artillery, and his wife, elected to remain, and they were joined by two ex-naval men; these, with some shipwrecked sailors, were the founders of the present settlement. After some years the five unmarried settlers contracted with a sea captain to bring them wives from St. Helena. Stores and provisions were provided out of a grant voted by Parliament and sent out by a warship, nearly all the able-bodied men having been drowned while attempting to board a vessel in Dec. 1885. In 1904 the is. was visited by H.M.S. *Odin* in order to ascertain whether the islanders would accept the offer of the Cape Gov. to settle them in the Cape Colony, but out of eleven families only three elected to go. During the Second World War detachments of the R.N. and the S. African Air Force were stationed on the is. to maintain a meteorological and wireless station. See Mrs. K. M. Barrow, *Three Years in Tristan da Cunha*, 1911; Mrs. Rose A. Rogers, *The Lonely Isle*, 1926; Douglas M. Gane, *Tristan da Cunha, an empire outpost and its keepers*, 1932; E. Christophersen, *Tristan da Cunha, the lonely isle*, 1940; A. B. Crawford, *I went to Tristan*, 1941; J. Brander, *Tristan da Cunha*, 1940; and P. A. Munch, *Sociology of Tristan da Cunha*, 1945.

**Tristearin** see STEARIN.

**Tristram**, see **TRISTAN**.

**Tristram Casket**, The, famous piece of early medieval art, a casket of wood with five decorative panels of carved ivory depicting the romance of Tristram and Isenlt. It came to light in 1913 in the shop of an unknown Paris dealer; it was acquired for the Brit. Museum in 1948 with the assistance of a grant from the National Arts Collection Fund. It is generally regarded as of late twelfth century date, and is ascribed to the Rhineland or possibly E. France.

**Tritonia**, or **Montbretia**, genus of *Iridaceae*, see **MONTBRETIA**.

**Triton**, according to Gk. legend, dwelt at the bottom of the sea with Poseidon and Amphitrite, his father and mother. He is represented as human to the waist and dolphin below, usually in the act of blowing a shell to calm the seas.

**Triumph**, highest honour accorded to a victorious commander among the Romans. Only a dictator, consul, or praetor holding the imperium or highest command was entitled to the distinction, and then only after success in true warfare, not rebellion, civil strife, etc. The honour with necessary expenses was granted by the senate, who assembled outside the city to receive the victorious general, still in command. The celebration took the form of a procession to the Capitol through the city; the streets were decorated with garlands, and the procession, headed by the senate and state officials, passed through crowds of spectators, who greeted it with cries of 'Io triumphe.' After the head came triumphators, then the spoils and trophies, and the crowns presented to the general by prov. tus. Following these came the sacrificial bulls, captives in chains, actors, musicians, and priests. Immediately behind was the triumphal car, gilded, garlanded, and drawn by white horses; in this stood the gen. wearing the garb of the Capitoline Jupiter, the purple *tunica palmata*, and toga picta, the former decorated with palm shoots, the latter with golden stars. An ivory sceptre surmounted by a golden eagle was carried in the left, a branch of bay in the right hand. Over his head a slave held the golden crown of Jupiter. Then followed the soldiers. Arriving at the Capitol, solemn sacrifice was made, and general festivity followed in the city. When the senate refused to authorize a T., the gen. might undertake one on his own account to the temple of Jupiter Latiaris, or he might be granted an ovation (*q.v.*).

**Triumviri**, three magistrates who constituted themselves the supreme heads of the Rom. republic. The first triumvirate, or board of triumvirs, was that of Julius Caesar, Pompey, and Crassus (60 B.C.), and the second, and last, that of Augustus, Antony, and Lepidus (43 B.C.). There were also *triumviri nocturni*, a board of three night watchmen, and *triumviri capitales*, who administered the death sentence.

**Trivandrum**, seaport and cap. of Travancore state, Madras, India, 53 m. S.W. of Tinneveli. Its chief buildings include the Maharajah's palaces, a temple of

Vishnu, and the univ. Pop. 128,400.

**Trnova**, or **Tirnovo**, tn. of Bulgaria, picturesquely situated on the Yantra, 35 m. S.E. of Sistova. Pop. 14,000.

**Troad**, The, see **TROY**.

**Troas**, see **TROY**.

**Trocadero**, **Palace of the**, see under **CHAILLOT**.

**Trochee**, metrical foot, which in the classical quantitative system consists of one long and one short syllable, and in the Eng. accentual system of one accented and one unaccented syllable.

**Trochilus**, see **HUMMING-BIRDS**.

**Troglodytes**, general Gk. name for 'cave dwellers', who were believed to dwell in the Caucasus and especially in Ethiopia and along the S. Red Sea coast of Egypt. They were cattle herdsmen. See also **CLIFF DWELLINGS**.

**Trogon** (Gr. *τρογών*, pres. part. *τρογώνων*, to gnaw), bird of the genus *Trogon* or family Trogonidae, widely distributed in tropical and subtropical regions, especially in America. It is a Coraciiform bird akin to the swift and is about the size of a thrush. It has soft plumage of varied and generally brilliant colouring, particularly marked in the quail (*q.v.*) species, and is noted for its short, spasmodic flight.

**Trogon**, **Long-tailed**, see **QUESAL**.

**Trogus Pompeius**, Rom. historian of Gallic origin, who lived in Rome during the rule of Augustus. He wrote *Historia Philippica*, a hist. of the Macedonian empire down to the Rom. conquest of the E.

**Troilus**, in Gk. legend, the son of Hecuba and Priam, king of Troy, and is variously represented as slain in battle or taken captive by Achilles. Classical legend knows nothing of the tale of faithless love which Chaucer unfolds in *Troilus and Cressida* and Shakespeare in *Troilus and Cressida*, this version of the legend being derived from medieval pseudo-Homeric writings.

**Trois-Rivières**, city of Quebec, cap. of St. Maurice co., on the N. shore of the St. Lawrence R., at the mouth of the St. Maurice R., halfway between the cities of Montreal and Quebec. It is a natural ocean port and the pop. is largely Fr.-Canadian. The city is the see of a Rom. Catholic bishop. T.-R. was founded in 1634 and the first Canadian industry, 'The Old Forges', was estab. there in 1737, where nails, stores, kettles, and frying-pans, previously imported from France, were manuf. The city is now a large producer of newsprint and a centre of the textile industry. It possesses important metallurgical plant and is the gateway to one of Canada's greatest sources of electrical energy. Pop. 49,000.

**Trojan Planets**, group of asteroids (*q.v.*), namely Achilles, Hector, Patroclus, Nestor, Priamus, and Agamemnon, which verify an important problem solved by Laplace. This is a particular case of the problem of three bodies, which can be stated as follows: if three bodies are placed at the angles of an equilateral triangle and move round their common centre of gravity under the influence of

their mutual attractions, then, provided they were originally projected in directions that all make the same angle with the lines joining them to their common centre of gravity, the velocity of projection of each being proportional to its distance from that centre of gravity, they will continually form an equilateral triangle. The Trojan group conforms approximately to the triangle condition, though, as their orbits differ from that of Jupiter both in eccentricity and inclination, the case is complicated, and each asteroid oscillates about the equilateral triangle point, the periods of the swings being about a century or more.

**Trojan War**, see TROY, and under ACHILLES, AGAMEMNON, and ULYSSES.

**Troll**, or **Trold** (old Norse, demon, giant), in Scandinavian folk-lore an ogre (sometimes a gnome) of either sex with evil powers exercised in darkness. The word undoubtedly had an onomatopoeic origin from awesome noises in wild mt. country suggestive of the footfalls of extranatural beings. Consequently Ts. are represented as berg- or cave-dwellers, whence their appellation. *Bjergfolk*. They are described as living in families, sometimes tribes, and often as possessing kings (cf. Ibsen's *Peer Gynt*, Act. II.). Many places in Scandinavia perpetuate belief in Ts., e.g. Trollheim (Troll's Home), an awesome part of Dovrefjell (setting of *Peer Gynt*), and actual belief in the existence of Ts. dies hard, though education has reduced them to bogies in children's books (cf. Ashbjørnsen and Moc, *Fairy Tales*), and their character has degenerated to that of peasant-life where some belief continues. In Eng literature many of the giants (as in Jack and the Beanstalk) and gnomes are descendants of T.'s in Scandinavian folk-lore, and pixies and malicious fairies are close relations. See T. Keightley, *Fairy Mythology*, 1828; Ashbjørnsen and Moc, *Samlede Kventyr* (containing pictures by Kittelsen), Gyl dendal, Oslo, 1940.

**Trolley-bus**, see under ELECTRIC TRACTION.

**Trollhättan**, tn. in the prov. of Elfsborg, Sweden. The falls of Trollhatta, over 100 ft. high, afford water power for the surrounding factories. Pop. 22,600.

**Trollope**. The family of T. has its place in the literary annals of England after Frances Milton (1780-1863) married Thomas Anthony T. (a Chancery barrister) in 1809. After a visit to America she wrote *Domestic Manners of the Americans* (1832), and numerous novels, including *The Vicar of Wrexhill* (1837), which had the honour of a caustic review by Thackeray, and *The Widow Barnaby* (1839).

**Trollope, Anthony** (1815-82), Eng. novelist and civil servant, b. in London, fourth son of Thomas Anthony and Frances T. (see preceding article). His parents removing to Harrow, Anthony became a day-boy at its school, where he was ill-treated and neglected. Obtaining a clerkship in G.P.O., 1834, he avoided dismissal, 1841, by taking a surveyorship in Ireland, where he acquired

his taste for hunting, manifest throughout his stories. T. married in 1844. He pub. his first novel, *The Macdermots of Ballycloran*, in 1847. Appointed inspector of postal deliveries, T. for two years toured England on horseback. He instituted pillar-boxes in 1853. Officially visiting Egypt and the W. Indies, 1858, on his return he pub. *The West Indies and the Spanish Main* (1859) a book of shrewd comments on the way of life of the people of the is. he visited. He visited the U.S.A. in 1861. Disappointed of an assistant-secretaryship, T. left the Post Office in 1867. In 1868 he stood for parliament as a Liberal at Beverley. He visited Australasia, 1871-72, and S. Africa, 1877, writing books about these countries. Meanwhile, through serials pub. in the *Cornhill*, the *Portsmouth*, and the *Pall Mall Gazette*, he had become a popular novelist. Besides domestic interest, he worked two veins—eccles. and political. His descriptions are precise and piquant, and his portraits, like his pictures of daily life, are the results of intuition and conjecture, rather than a photographic reproduction of what he saw. Nevertheless his methods tend to give an impression of average truth. Although but slightly acquainted with the clergy, he made his clerics convincing: like himself, stubbornly Eng. rather than saintly. The bishop's wife, Mrs. Proudieu (carried, like most of T.'s characters, from book to book), is immortal as a type of domineering vulgarity. The specially eccles. or 'Barchester' series begins with *The Warden* (1855), and ends with *The Last Chronicle of Barset* (1867). The other novels in the series were *Barchester Towers* (1857), *Doctor Thorne* (1858), *Framley Parsonage* (1861), *The Small House at Allington* (1864). The political interest in T.'s novels begins in *Phineas Finn* (1869), it tails away with *Is He Popenjoy?* (1878). T. wrote forty-seven novels, besides short stories; also left one novel, *The Land-Leaguers*, unfinished when he died. It was pub. in 1883. His *Autobiography*, written in 1875, was pub. in 1883.

See H. James in *Partial Portraits*, 1888; T. H. S. Escott, *Trollope: His Work, Associates, and Literary Originals*, 1913; A. A. Baumann, *The Last Victorians*, 1927; H. Walpole, *Anthony Trollope*, 1928; M. Sadleir, *Trollope: a Bibliography*, 1928, and *Trollope: a Commentary*, 1927, 1933; L. P. and R. P. Stebbins, *The Trollopes: A Chronicle of a Writing Family*, 1946; and Elizabeth Bowen, *Anthony Trollope: A New Judgment*, 1946.

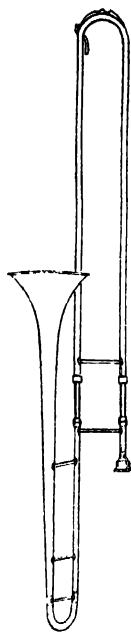
**Trombone**, brass wind instrument, developed from the medieval sackbut, made in four sizes apart from some freaks; alto, tenor, bass, and contrabass, the first of which is now very rarely used, parts written for it being played on the tenor T., while the last hardly ever appears in the orchestra, except in Wagner's *Ring*. The T.'s most characteristic feature is the slide, by means of which the tube can be adjusted to different lengths in seven positions,

so that all the notes of the chromatic scale can be produced as natural harmonics. The T. was thus a chromatic instrument long before the horn and trumpet became so by the invention of

the valves. The intonation, as in string instruments, is not fixed, but depends entirely on the player's ear and skill. Many notes are, of course, available in more than one position (as different harmonics), so that the player often has the choice between an easier and a more difficult way of passing from note to note. A strict *legato* between notes in different positions is not possible, as the breath has to be interrupted during the change of the slide to avoid an unpleasant scoop; but this scoop, usually designated by the hybrid term *glissando*, can be used as a special effect, though, having been exploited by the music-halls as a comic vulgarity, it rarely appears in serious scores. The range of the tenor T. is from E below the staff in the bass clef to B<sub>4</sub> above middle C, with two or three possible but dangerous notes higher and three pedal notes (B<sub>3</sub>, A and Ab) below the bass E. The alto T. has the same range a perfect fifth higher, the bass T. an augmented fourth lower, and the contrabass T. an octave lower. In the nineteenth century valve Ts. were invented and gained favour in military and brass bands as being easier to play, though even there it is admitted that their tone is inferior to that of the slide T. The valve T. never gained a firm footing in the orchestra.

**Tromometer**, see SEISMOGRAPH AND SEISMOLOGY

**Tromp**, Martin Harpertzsoom (1597-1653), Dutch admiral, b. at Brielle, whose name is associated with the seventeenth-century struggle for the command of the seas between the Dutch and the Eng. As a boy he went to the E. Indies in a merchant ship, was made prisoner, and passed some years aboard an Eng. cruiser. Escaping to Holland he entered the navy in 1624, becoming lieutenant-admiral in 1637. In Feb. 1639 he destroyed a large Sp. squadron off Gravelines, and in Sept. of the same year defeated the combined fleets of Spain and Portugal off the Eng. coast, capturing thirteen richly-laden merchantmen. When war broke out with England he sailed to the Downs



TENOR  
TROMBONE

with a large fleet and anchored off Dover but was worsted by Blake (May 19, 1652), whose fleet was much inferior in numbers. In Nov. he returned with eighty warships and a large convoy of merchantmen. Blake attacked near Dungeness on Nov. 30, but after sustaining severe losses drew off in the darkness and anchored off Dover, sailing next day to the Downs while T. anchored off Boulogne until his convoy had reached safely. The story that T. sailed up the Channel with a broom at his masthead is of doubtful authenticity. In Feb. of the following year, while again convoying many merchantmen, he kept up a running fight with the combined fleets of Blake, Monk, and Penn off Portland to the Fr. coast near Calais, and had the worst of the encounter, losing nine warships and forty merchantmen. On June 3 he fought an indecisive engagement with an Eng. fleet in the Channel, but Blake came up with reinforcements and so enabled the Eng. to gain the upper hand. T. withdrew to the Texel with the loss of nearly a score of ships. The Dutch then negotiated for peace, but war was soon renewed and T. again appeared in the Channel towards the end of July, 1653, and in a fierce battle with the Eng. under Monk on July 29 T. was shot through the heart. In all he was credited with victories in over thirty encounters. He was buried at Delft where in the old church there is a monument to his memory. See his *Journal* (ed. and trans. by C. R. Boxer), 1930. •

**Tromsø**, cap. of the dist. of Tromsø, in the N. of Norway, on an is. of the same name. It is the chief port for Spitsbergen, and the seat of a bishop. The chief occupation is whaling. During the Second World War T. was converted into a sea-plane base by the Gers. Attacks were made from it on the Allied convoys sailing to Murmansk. The dist. has Lapp settlements, and fishing is carried on. Area of dist., 10,005 sq. m. Pop. 113,200. Pop. of tn. 10,700.

**Trondhjem**, city and seaport in Norway, and former cap., lies at the mouth of the Nid, on Trondhjem Fjord, 81 m. E.N.E. of Kristiansund. Herrings and other fish, deals, copper, and train oil are the staple exports, and shipbuilding, fish-curing, and the manuf. of paper and machinery are local industries. Broad thoroughfares pass between rows of wooden houses. Since earliest times the coronation of the kings of Norway took place in the cathedral, which is one of the most celebrated in Scandinavia. The importance of T. began to wane after the Reformation. In the Second World War T. fell to the Gers. in the spring of 1940 and became an important U-boat base and was frequently bombed by the Allies: the Ger. cruiser *Prinz Eugen* was heavily damaged by an R.A.F. attack, while undergoing repairs in T. It was from T. that the mass-resignation movement of Norwegian clergy began, as a protest against the appointment of the collaborator, Quisling, as Prime Minister. T. was liberated by the Allies in May 1945. Pop. 56,400.

**Troon**, municipal burgh and port of Ayrshire, Scotland, on the Firth of Clyde, opposite Arran. Until the eighteenth cen. T. was a small fishing hamlet but the building of T. harbour in 1808 transformed it into an important port and shipbuilding centre. It is now noted as a holiday resort and possesses good golfing facilities. Pop. (est.) 10,000.

**Troop**, originally the unit of cavalry corresponding to the company. A captain's command, in the eighteenth century it could be up to 400 strong. It now corresponds to the infantry platoon and is hence a subaltern's command in armoured regiments. T. is also the traditional unit of horse artillery and since 1938 has been the sub-unit of other artillery. In field regiments R.A. it constitutes half the eight guns of a battery and is commanded by a captain. In light anti-aircraft regiments it consists of 6 guns, also commanded by a captain. In anti-tank regiments it consists of four guns and is commanded by a subaltern.

**Trophy** (from Gk. *τροφαῖον* and *τρεφω*, to fatten) in classical times a memorial of victory set up at the spot where the enemy had turned.

**Tropical Agriculture**, Imperial College of, see IMPERIAL COLLEGE

**Tropical or Equinoctial Year**, see under YEAR

**Tropical Hygiene**, see under HYGIENE

**Tropical Medicine**. Owing chiefly to climatic conditions, many diseases rare or unknown in temperate and colder regions are common in the tropics. The tropical climate favours a great variety of parasites causing serious diseases in man. The parasites are transmitted directly from man to man by food and drinking water contaminated with faeces; by water harbouring parasites discharged from snails; by water containing crustacea infected with parasites or by blood-sucking insects which inoculate parasites when they bite. Other tropical diseases such as beri-beri are due to deficiencies in diet, to unwise exposure to the sun, and to animal and vegetable poisons. Anc. Egyptian and Indian records show some knowledge of T. M., and the extraction of the guinea-worm was known to Moses; but the scientific study of the subject may be regarded as beginning in the sixteenth century, a result of explorations and the estab. of communication between the Old World and the New. This led not only to the discovery, but also to the dissemination, of diseases hitherto unknown to Europeans. The literature of T. M. began during last century, and has subsequently grown considerably. The invention of the microscope made possible the identification of minute parasites and the study of their life histories. It led to the discovery of the causative organisms and transmission of such diseases as malaria (*q.v.*), sleeping sickness, leprosy, and amoebic dysentery. Results of microscopic research were often fully confirmed by experimental infection of the research workers, sometimes with fatal results. The chief diseases due to Protozoa (*q.v.*) are malaria, black-water fever,

black fever (kala-azar), sleeping sickness (trypanosomiasis), and amoebic dysentery. Tsetse flies, carriers of the trypanosomes of sleeping sickness, are confined to Africa, so that African slaves transported to America failed to establish the disease there. Trypanamide injected in the early stages effects a cure, and may even do so in advanced stages; the drug atilide has recently been introduced for trypanosomiasis of cattle in Africa. No effective treatment is known for S. Amer. trypanosomiasis, carried by bugs. Quinine and the synthetic mepracrine and paludrine are specific remedies for malaria, and antimony compounds for kala-azar. Relapsing fevers are caused by spirochaetae carried by ticks, lice, and the teeth of rodents. The injection of arsenical compounds is an effective treatment. Typhus fevers are divided into three groups according to their transmission by lice, ticks, and mites. Diseases due to filterable viruses are yellow fever (*q.v.*), and dengue, transmitted by mosquitoes, and sandfly fever (*q.v.*), carried by sandflies (*Phlebotomus*). Plague, a pandemic disease discovered by Kitasato and Yersin to be caused by *Bacillus pestis*, is transmitted by rat fleas. Serum has been used for treatment and vaccines for protection. Cholera, a water-borne disease, causes serious epidemics with high mortality rate. Treatment consists in maintaining the fluid content of the body by injection of salt solutions, while protection is conferred by vaccines. Leprosy, an aet. disease long considered incurable, was discovered by Hansen (1871) to be due to *Mycobacterium leprae*. During the twentieth century, treatment with the derivatives of chaulmoogra, hydrocarpin oil, has been found to effect a cure in the early stages, and in a small percentage of advanced cases; sulphonamide drugs are now being used. Brilliant research has been carried out in connection with the various parasitic worms causing ankylostomiasis, filariasis, guinea-worm, bilharziasis (*q.v.*), and other diseases. Antimony compounds are specific for bilharziasis, and oil of chenopodium in carbon tetrachloride for ankylostomiasis (hookworm). The advance of T. M. has been accomplished by the devotion and sacrifice of workers too numerous to mention. A few of the outstanding names are those of Manson, Ross, Emin Pasha, Laveran, Grassi, Bruce, Reed, Leishman, Eijkmann, and Stanton. There are schools of T. M. associated with the univs. of Liverpool and of London. See S. P. James, *Malaria at Home and Abroad*, 1920; C. M. Wenyon, *Protozoology*, 1926; K. K. Chatterji, *Tropical Surgery and Surgical Pathology*, 1927; A. C. Chandler, *Introduction to Human Parasitology* (5th ed.), 1936; H. H. Scott, *History of Tropical Medicine* (2nd ed.), 1942; Sir L. Rogers and J. W. D. Megaw, *Tropical Medicine* (5th ed.), 1944; Sir F. Manson, *Tropical Diseases* (12th ed.), 1946.

See also ANKYLOSTOMIASIS; BILHARZIASIS; BLACK-WATER FEVER; CHOLERA; DENGUE; FILARIASIS; GUINEA-WORM; HYGIENE; LEPROSY; PALUDRINE; PLAGUE;

SLEEPING SICKNESS; TROPICAL HYGIENE; TSETSE FLY.

**Tropics** (Gk. *τροπή*, a turning), two circles drawn round the earth parallel to the Equator, at a distance of  $23\frac{1}{2}^{\circ}$  N. and S. of it. The S. tropic, called the Tropic of Capricorn, has the sun vertically overhead on Dec. 21. The sun is vortical at the N. tropic, called the Tropic of Cancer, on June 21. At all places between the T., i.e. in the tropical or torrid zone, the sun is vertical twice during the year, but at places beyond the T., the sun is never vertical.

**Tropine**,  $C_{11}H_{15}ON$ , white crystalline solid, m.p.  $108^{\circ}$  C., obtained by the hydrolysis of the alkaloid atropine (q.v.). It is poisonous, hygroscopic, and optically inactive.

**Tropisms**, name applied in biology to the movements of plants and animals, or parts of them, in response to external stimuli. Thus plant roots will grow towards water (positive *hydrotropism*) and towards the centre of the earth (positive *geotropism*), while plant shoots grow towards the light (positive *heliotropism*) and away from the centre of the earth (negative *geotropism*). Other Ts. are *chemotropism* (towards or away from regions of greater concentrations of certain chemical reagents), *galvanotropism* (electrical), *thermotropism* (heat), etc. The Ts. are involuntary and automatic.

**Troposphere**, part of the atmosphere, extending in temperate regions about 7 m. up from the earth's surface, in which, except for temporary intervals, temp. falls with height. *Tropopause* denotes the imaginary boundary between the T. and the stratosphere (q.v.).

**Tropopause**, see under STRATOSPHERE and TROPOSPHERE.

**Troppau**, see OPAVA.

**Trossachs** (i.e. bristled ter), picturesque glen of Scotland, Perthshire, between Lochs Katrine and Achray. This rugged and narrow defile is about  $1\frac{1}{2}$  m. in length, and overlooking it are Ben Venne, 2,390 ft., and Ben A'an, 1,850 ft. It was first made popular by Sir Walter Scott in his *Lady of the Lake*.

**Trotsky** (Gatchina, or Gatchina), tn. in the Leningrad Region of the R.S.F.S.R. There are porcelain works and a former royal palace. Pop. 15,000.

**Trotsky, Leo** (originally **Leiba Davudov Bronstein**) (1879-1910), Russian revolutionary leader, b. near Elizavetgrad in the Kherson prov. His father David B. was a Jewish chemist. In 1888 he was sent to live with a relative at Odessa, where he attended the St. Paul Realschule. In 1896 he finished his schooling at Nikolayev, turned Socialist, and broke with his family. He was arrested in Jan. 1898, and exiled to Siberia, 1900. In 1902 he escaped and travelled through Paris to London, where he assisted Lenin with the periodical *Iskra*. To the latter he seemed too moderate; and their association ended in 1903. Returning to Russia in 1905, T. joined the St. Petersburg Soviet, but was arrested early in Dec. In Jan. 1907 he was re-exiled, but at Berezov on the way E. he escaped. In

Vienna he issued *Pravda*, a bi-monthly. When war broke out in 1914, he went to Zurich, thence to Paris, conducting pacifist propaganda obnoxious to both sides. T. was expelled from France and Spain, 1916, and lived in U.S.A. till March 1917. He then embarked for Russia, but was detained till April 29 at Halifax, N.S., by the Brit., and at Petrograd he was imprisoned by Kerensky; T. had now joined forces with Lenin again, and with him brought about the successful Oct. Revolution. He became Commissar for Foreign Affairs under Lenin, and represented Russia at Brest-Litovsk. He became Commissar of War and created the Red Army that defeated Denikin, Judenich, Kolchak, and Wrangel, but he was opposed to the disastrous Polish war of 1920. After Lenin's death, the rivalry between T. and Stalin became acute. The quarrel between the two men has been too loosely phrased as one between an international and a national Communist. From T.'s life of Stalin it would appear that it was nothing more than a quarrel between a theorist and an opportunist, both committed to the same fundamental ideals. T. sacrificed himself for a method rather than for an ideal. He was employed as head of various technical boards till the autumn of 1927, when he was expelled from the Communist party, and in Jan. 1928, exiled to Alma-Ata in Turkestan. T. had been removed from the post of Commissar for War in 1925, and in 1929 he was deported from Russian ter. and took up residence in Constantinople. Eventually he found asylum in Mexico City. His life was constantly threatened by Communist opponents, and finally a brutal attack was made on him from which he d. His major literary work was *The History of the Russian Revolution*, trans. by M. Eastman (1933), but his life of Stalin, trans. into Eng. (1947), though incomplete and of less literary merit, is equally important. See E. Hurwitz, *Staatsmann und Abenteuerer* 1929; M. Eastman, *Leon Trotsky*, 1926; P. Fervacque, *La Vie orgueilleuse de Trotsky*, 1929; B. O. Wolfe, *Three Men Who Made a Revolution*, 1918.

**Trotting**, form of horse-racing peculiarly Amer., though a great part of the best trotters in the U.S.A. are descended through *Hambletonian* from the Eng. thoroughbred *Messenger*. The horse is driven in a small trap known as a sulky. The race is run in heats, and a horse must win three heats before it can be declared the winner. T. still holds an important place in the U.S.A. The world's record for 1 m. in T. (1 min. 53 $\frac{1}{2}$  sec.) was gained by Greyhound (against time) at Lexington in Kentucky, Sept. 29, 1938. The fastest pacing m. recorded (1 min. 55 secs.) is that of Billy Direct (1938).

**Troubadours**, class of early poets who appeared in Provence. The etymology of the word is uncertain; Provencal *trobar* means 'to find,' but it is possibly connected with late Lat. *trobare* or *trouper invenire*, to find or invent verses. The Ts.

were inventors of a species of lyrical poetry, characterised by an almost entire devotion to the subject of chivalric love, and generally very complicated in regard to the metre and rhyme.

They fl. from the eleventh to the latter part of the thirteenth century, principally in the S. of France (but also in Aquitaine, Auvergne, Languedoc, Catalonia, Aragon and N. Italy). The Ts. were the *trouvères* of the S., just as the *trouvères* were the *troubadours* of the N.; the former spoke the langue d'oïl, the latter the langue d'oc—a distinction more arbitrary than real—but the difference in the idiom of the N. and S. and in the customs of the poets who employed those idioms as also in the style of their composition is so marked that the two classes have always been treated separately. The Ts. were no doubt the natural heirs of the poets of the Latin decadence, for their poetry had its birth and its development exclusively in the countries forming the southern provs. of Rom. Gaul. The distinctive characteristics of their poetry are tenderness, elegance, and flattery; it admirably reflects their wandering life, love of women, and the need to provide for life's necessities. The *trouvères*, with a more virile style and in a ruder tongue, favoured epics and raised poetry to the level of their character, which is exemplified in their proverbial description as men who held a pen in one hand and a sword in the other. The Ts. softened by a milder life and a more enervating climate were contented with the composition of songs alone, and these songs were sometimes notable for their wit, though mainly for their naïveté, and they were almost always marred by want of taste, tedium, and diffuse subtlety. None the less, the intimate life of the whole *nudi* breathes through the lyrical or satirical songs of the Ts. War, religion, and women were the three grand sources of their inspiration.

It is generally considered that it was the destruction of the county of Toulouse that dealt the death-blow to the Ts. as an institution, for they could then no longer find patrons or protectors of sufficient power to afford them personal security. Some of the most celebrated Ts. were Bertrand de Born; Geoffroy Rudel, Bernard de Ventadour; Gaucelm Faydit, Arnaut de Marvell; Bertrand de la Tour; Pierre Vidal; Raymonde le Preux; Geoffroy de Luc; Pierre de St. Rémy; Boniface; Ogiers; Arnaut Daniel; Giraud de Bornell; Marchebruse; and Sordello. Often Ts. were of a servile or low condition, but by no means always, for nobles, princes and even kings either were Ts. or cultivated the arts of the Ts., e.g. Frederick Barbarossa, Richard Cœur de Lion, Alphonse II. and Pierre III. of Aragon, the marquis de Montferrat, and the comte de Foix. These gave themselves over to Provençal poetry and vied with the other Ts. in the courts of love for the prizes accorded to poetry; and out of this rivalry sprang a veritable camaraderie of talent. Some of the more famous of the songs of the Ts. were *Dame de Bourdon* (or

*Flamença*); *Gérard du Roussillon*; *Chronique des Albigeois*; *Roman de Gaufré*; *Pier-à-Bras*; and *Blandin des Cornouailles*. See H. J. Claytor, *Troubadours and England*, 1923; J. Anglade (ed.) *Anthologie des Troubadours*, 1927, and *Les Troubadours, vies, œuvres, etc.*, 1929; A. Jeauray, *Poésie lyrique des troubadours*, 1934.

**Tropical, or Troopial, (Icterus)**, genus of birds with yellow and black plumage. The common T. or Brazilian banguet (*I. vulgaris*) is a handsome bird which is sometimes kept as a pet; it learns to whistle tunes.

**Trout**. The T. is a widely distributed freshwater fish of the salmon family, which may be roughly recognised by the presence of a small fleshy fin between the dorsal fin and the tail. Its appearance is unmistakable, although its colouring is extremely variable, ranging from almost black to light olive, according to habitat, with the characteristic black or red spots. The eggs are laid in the gravel of streams, in winter, and hatch three to four months later, but the fish may move into lakes at other times. The food is mainly animal, consisting of insects, their larvae, and small fish, the size attained depending almost entirely on the abundance of the food supply; in Britain T. of over 20 lb. have been caught, but the normal size is below 1 lb. It is considered at present that the native T. is one species (*Salmo trutta*), of which the *sea trout*, which feeds to sea and ascends rivers to spawn is a particular variety. This fish broadly speaking resembles a salmon in appearance, and has a similar life cycle, descending to the sea at two to four years of age, and returning to spawn annually when adult. The term 'Bull trout' is applied locally to old 'T.', sea T., and also to salmon which have spawned in the past; there is no evidence of a distinct variety to which the name could be strictly applied, and its use leads to confusion.

The T. is prized for its culinary and sporting qualities, and is commercially bred and reared (see  *Pisciculture*) to stock streams. The Rainbow T. (*S. irideus*), an Amer. introduction, is more commonly reared for the table, as it grows faster, but it does not establish itself when used for stocking waters in Great Britain. The life hist. of salmon and T. can conveniently be determined by microscopic examination of their scales; age, growth rate, and spawning hist. can be determined, which greatly assists the proper management of waters.

**Trouvères**, see **TROUBADOURS**

**Trover, or Trover and Conversion**, in law, the name of an old form of action which lay against anyone who converted or appropriated to his own use any personal property, in which the plaintiff had either a general property as owner or a special property as bailee. Since the Common Law Procedure Act, 1852, which practically abolished the old common law forms of action, the substance only and not the form of the action has survived.

**Trowbridge**, mkt. tn. of Wiltshire, England, famous for its West of England cloths. Pop. 14,000.

**Troy, Ilium, or The Troad** (Τροίη, Τροία, Ἰλίους γῆ, or Ἰλίων, ἡ Τρωάς), famous city and dist. of Asia Minor, forming the N.W. of Mysia. The dist., usually known as 'The Troad,' was bounded W. and N.W. by the Aegean and the Hellespont, E. by a ridge of Mt. Ida, S. by the gulf of Adramyttium, its coast-line extending from Lectum promontory (S.) to the R. Rhodius (N.) below Abydos. The greatest length of the Troad from N.W. at Cape Sigæum (now Yenî Shehr) to the S.W. at the Lectum promontory (Baba Kale) is about 40 m., and the breadth about the same. The central part is drained by the Menderes, anct. Scamander, which rises in Ida and reaches the Hellespont E. of Cape Sigæum. There are pine forests on Mount Ida and, in the plains, willow, cypress, tamarisk, valonia, oak, etc. The vine is cultivated, together with wheat and maize. Even in anct. times it was fertile and populous, while under Turkish rule its fertility alleviated the poverty of its inhab.

In classic legend, the earliest king of this country was Teucer, after whom the Trojans are called Teucri or Teucrarians. His daughter married Dardanus, a neighbouring chieftain, hence Dardanidae (sons of Dardanus) is another name for Trojans. They were probably a Pelasgian race possibly descended from Thracian emigrants. Dardanus was grandfather of Tros, whose son Ilius founded Ilium or the city of Troy (N.), the largest and strongest settlement in The Troad. The next king of T. was Laomedon, who was succeeded by his son Priam, in whose reign the famous siege of T. by the Gks. took place, to avenge the rape of Helen, wife of Menelaus of Sparta, by Priam's son Paris. This siege lasted nearly ten years, and ended with the sack and capture of T. by a stratagem of the Gks. (c. 1184 B.C.). The story is told in Homer's *Iliad*, and part in Virgil's *Aeneid*. It is now considered purely legendary, it is now commonly regarded as historical in the main outlines, the rape of Helen, perhaps, representing some act of piracy. Among the chief Gk. heroes of the siege were Achilles, Agamemnon, Menelaus, and Odysseus; and among the Trojans, Hector, Paris, and Aeneas. A small city on the site in Alexander's day was in ruins by Strabo's time. The site of the anct. T. is marked by the Hisarlik mound. The explorations carried on here by Schliemann (1870-90) and Dörpfeld (1893-94) brought to light much valuable information. Remains of some nine different cities were discovered, buried one beneath another, the earliest dating from about 3000 to 2500 B.C. Probably the beginning of the seventh phase in the hist. of the city, was the Homeric T. There are traces of two Gk. settlements (1000- first century B.C.), and of a new Ilium (first century B.C.-A.D. 500). See *Herodotus*, v. 95, vii. 75; *Strabo*, xiii.; J. B. Lechevalier, *Voyage de la Troade*, 1802; H. Schliemann, *Ilios*, 1880; and *Troja*, 1883; H. R. H. Hall, *Mycenaean Age*, 1901; W. Ridgeway, *Early Age of Greece*, 1901; W. Dörpfeld, *Troja und Ilios*, 1902;

J. Lydgate, *Lydgate's Troye-book*, 1412-20 1906.

**Troy**, co. seat of Rensselaer co., New York, U.S.A., on Hudson R. Shirts, collars, and cuffs are among the chief manufs. There are Bessemer steel-works and paper mills. Pop. 70,300.

**Troyes**, cap. of the dept. of Aube, France. The settlement once of the Tricassi, in the Middle Ages it became one of the richest cities in Champagne and is noted for its Gothic cathedral, damaged in the Second World War. Here in 1420 was signed the treaty granting the Fr. crown to Henry V. of Eng. There are hosiery manufs., and a trade in wine. In the Second World War it fell to Gen. Patton's armoured forces late in Aug. (1944). Pop. 58,800.

**Troyon, Constant** (1810-65), Fr. painter, b. at Sèvres. He was an accomplished colourist and excelled as a painter of cattle. There are pictures by him in the Louvre, the Wallace Collection, and the Glasgow Art Galleries. See life by A. Hustin, 1893, and W. Gensel, *Corot et Troyon*, 1901.

**Troy Weight**, term probably originating from weights used in the fn. of Troyes in France. The term 'troy' was first applied to the standard pound in 1495, and was exclusively employed by the dealers in the precious metals, gems, and drugs. See further under WEIGHTS AND MEASURES.

**Truce of God**, see GOD'S TRUCE.

**Truck Acts**. The object of the T. A. are: (1) to ensure the payment in coin of wages in hiring contracts, and (2) to render illegal any provision in a contract for the payment of wages otherwise than in current coin. Historically the T. A. had their origin in fifteenth-century enactments framed to put an end to the practice of defrauding workmen and labourers by paying them in goods of a poor quality or by making unreasonable and excessive deductions from their wages. The Act of 1831 makes it a misdemeanour to make payment by delivery of goods; and by the combined operations of that Act and the Act of 1887 it is illegal for an employer to make any deduction or set-off for goods supplied, either by himself or through any agent of his; and, further, contracts which attempt to specify the place or manner in which wages are to be expended are null and void. The Act of 1896 punishes employers who make contracts with workmen for any deductions from wages by way of fines, unless (1) the terms of the contract are contained in a notice kept constantly posted up in some conspicuous place; and (2) the contract is in writing and signed by the workman, and specifies the acts or omissions in respect of which fines may be imposed, and the amount of such fines. In any event fines can only be imposed for acts or omissions likely to cause damage or loss to the employer, or 'an interruption or hindrance to his business.' There are similar provisions in the Coal and Metalliferous Mines Regulation Acts. The prin. exemptions from the T. A., apart from those impliedly stated above, are: (1) deductions (under written con-



tracts) in respect of materials and tools to miners, fuel, provender for beasts in business, rent, and medical attendance; and (2) deductions for advances by way of contributions to benefit societies or for education of children (including, of course, payments under the National Insurance Acts). The T. Act, 1940, was passed in consequence of the House of Lords' decision of that year in *Pratt v. Cook, Sons and Co. (St. Paul's) Ltd.*, where an artificer had been employed for wages plus meals prepared on the employers' premises, there being no written agreement signed by the employee. The court decided that the contract and payments made otherwise than in current coin were illegal and void and that the employee could recover so much of his wages as had not been paid in cash for a period not exceeding 20 years. The Act of 1940 restrains legal proceedings under the T. Acts in respect of transactions which, like the above, might lawfully have been effected in another form. Currency notes and bank notes for one pound and ten shillings are equivalent to cash and may be, and of course are, given in payment of wages, notwithstanding the provisions of the T. A., 1831, which, as a general principle, requires payment to be made in current coin of the realm (Currency and Bank Notes Acts 1914 and 1928). See H. S. G. Halsbury, *Laws of England*, vol. 14; *English and Empire Digest*, vol. 21; A. S. Diamond, *Law of Master and Servant* (2nd ed., 1916); S. Stone, *Justices' Manual* (annually).

'Truculent,' Brit. submarine of the 'T' class patrol submarines of the war construction programme, completed in 1942, of just over 1000 tons. On Jan. 12, 1950, in the vicinity of the W. Oaze buoy, Thames estuary, at 7.1 p.m., she collided in 9 fathoms of water with the 643 ton Swedish tanker, *Durina*, with the loss of 64 men, there being 80 aboard (6 officers, 56 ratings and 18 dockyard workers). The *Durina* rescued ten men.

Trudelin, see FRIDOLIN

Trujillo: 1. Tn. of Spain, birth and burial place of Pizarro and the centre of an agric. dist. in the Estremadura. Pop. 15,000. 2. Seaport of Honduras on the Atlantic coast. Pop. 4500. 3. Tn. in Peru, cap. of dept. of La Libertad, with ruins of the ancient Indian city of Gran Chimú. Cocoa is grown in the dist. or oases of T. The dist. is occupied predominantly by large estates devoted to the cultivation of the sugar cane and the two oases of T. produce 56 per cent of the Peruvian sugar. It is a univ. tn. and the seat of a bishop. Pop. 41,500. 4. State and its cap. in Venezuela. The tn. stands at an altitude of 2700 ft on the trans-Andean Highway. It produces coffee, cacao, sugar, Indian corn, and tobacco. Pop. 18,000. Pop. of state 264,000. Area 2856 sq. m.

Truman, Harry S. (b. 1884), thirty-third president of the U.S.A., b. in Lamar, Barton co., Missouri, of Scottish and Eng. descent. He was educated at the high school, Independence, Missouri. From 1900 to 1905 T. held small commercial

posts, and for the next twelve years farmed his parents' land near Independence. Soon after the U.S.A. entered the First World War, T. joined the army and served with distinction in France in command of a battery of field artillery. In 1922 T. was elected judge of the Jackson co. court, a body concerned with the supervision of the co. administration. In 1934 he was elected a senator for Missouri in the Democratic interest and re-elected in 1910. The following year he turned his attention to the spending of public money in war contracts, and he was instrumental in the formation of a Senate committee, of which he became chairman. When President Roosevelt was nominated for a fourth term in July 1941, the Demo-



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cratic Convention's choice of T. as vice-president was acceptable to both the liberal and left-wing groups and to the more conservative elements. The value of avoiding a change of leadership at that particular juncture of world affairs—a value which T. himself recognised—was destroyed by the death of Roosevelt on April 12, 1945. T. succeeded to the presidency after having been in office as vice-president only eighty-three days.

On April 16, T. as president addressed Congress for the first time, stating he would follow Roosevelt's policy at home and abroad. The war in Europe ended on May 8, and in July T. was in Berlin, taking part in the Potsdam Conference (q.v.). It then fell to him to announce to the world the fact of the existence of

the atom bomb and to authorise its use against Japan.

In general T. had the support of Congress, on which he relied for the passage of his legislative programme, but only a small part of it was passed by the end of 1945, including principally Amer. participation in the Bretton Woods Agreements (q.v.) and in the United Nations Organisation. Actions which were criticised were the cancellation, with some exception, of all outstanding contracts under lend-lease, and the removal of price-control and rationing. Throughout 1946 T. was faced with severe labour troubles against which he took energetic action, but he showed his sympathies towards Labour by vetoing the strike control bill, which Congress eventually passed. On foreign affairs he paved the way for the U.S.A. to take up its position of leadership among the democratic countries, and in this T. made his greatest contribution to post-war statesmanship. When the Eightieth Congress assembled in Jan. 1947 with a Republican majority, hostile to T., he reaffirmed the end of isolationism and declared that America must continue to shoulder its responsibilities to the world. Addressing Congress again on March 12, he made a notable speech, calling for aid to Greece and Turkey and initiating what later came to be known as the 'Truman doctrine,' the policy for helping countries threatened by, and anxious to resist, Communism. Later in the same year he supported his secretary of state, Gen. Marshall, in the plan to aid Europe, and the following year launched the Economic Co-operation Administration (see under ORGANISATION FOR EUROPEAN ECONOMIC CO-OPERATION). In the presidential elections of 1948, T. based his campaign on the failure of Congress, controlled by the Republicans, either to carry his anti-inflationary legislation or to check the rising cost of living. T. was confident of success at the polls, but all forecasts were against him. In the event 21,101,836 votes were cast for him and 21,969,500 for his nearest rival, Mr. Thomas Dewey. He carried twenty-eight states, giving him 503 electoral votes against 189 for Dewey. T.'s re-election as president was a great and unexpected personal triumph for T., and in his message to Congress in Jan. 1949 he proposed to put into effect his 'New Deal' policy of increased social security combined with measures to keep down prices. In his inaugural address as president for his second term he promised Amer. participation in the security arrangements of the N. Atlantic. Shortly afterwards the Atlantic Pact was negotiated, and T. was present at the ceremony in Washington on April 4, 1949, when the treaty was signed by the foreign ministers of the Twelve nations concerned. The president has consistently realised the responsibilities of the U.S.A. in international affairs, and he has given effect to this both in the Atlantic Pact and in his economic policy. On June 27, 1950, immediately following the invasion of the S. Korean republic, he announced the

armed intervention of the United States (see UNITED NATIONS CHARTER; UNITED STATES, *History*). In domestic politics his success rests largely on his great ability as an administrator, his adherence to constitutional procedure, and his powers of quick decision.

**Trumbull, John** (1756-1843). Amer. painter, son of Jonathan T., lived alternately in his native country and England, where he studied under Benjamin West. He is pre-eminently the artist-historian of the War of Independence, in which for a time he served as aide-de-camp to Washington. The largest single collection of his pictures is in the possession of Yale College, but 'The Signing of the Declaration of Independence' and three other large pictures now adorn the Capitol at Washington.

**Trumper, Victor Thomas** (1877-1915). Australian cricketer, b. at Sydney, N.S.W. He played for New S. Wales and represented Australia 18 times. T. was a brilliant batsman, his highest score against England was 185 not out, 1903-04; and he made 300 not out against Sussex, 1899. During his career T. scored 42 centuries and in 1913-14 with Sims, he made a record eighth wicket partnership of 433.

**Trumpet.** A brass wind instrument tracing its descent through the bugle to the Rom. lituus or tuba. It consists of a long narrow brass or silver tube, bent twice on itself, so that two of the parallel branches form with the third a kind of rectangle with rounded corners. The mouthpiece is cup-shaped and the other extremity broadens out like a convolvulus. Until the invention of the valves in the nineteenth century the T. was capable of producing only the natural harmonic notes, for which reason, combined with that of its mellow and carrying tone, it was found useful for fanfares, and for military purposes was often combined with kettle-drums, a practice clearly reflected in the scores of classical orchestral works up to the early nineteenth century. The valves made the T. a chromatic instrument, first made in the pitch of F, transposing a perfect 4th up. The Ts. in modern use, however, are usually in B $\flat$  or A, transposing a major 2nd or a minor 3rd down, respectively, the written compass being from F $\sharp$  below middle C to C above the staff in the treble clef, sounding respectively E-B $\flat$  and D-A. There are also Ts. in C, and the T. in F is still in use.

**Trumpeter**, or *Psophia*, genus of S. Amer. birds allied to the cranes. *P. crepitans* is a bird of lustrous and brilliantly coloured plumage and is often domesticated.

**Trumpet Flower**, or **Cross-Vine**, alternative names for the *Bigonia* (q.v.).

**Truro**, city and municipal bor. of Cornwall, England, on the R. Truro, a branch of the Fal, 9 m. N. of Falmouth and 279 m. from London. It is an anct. tn., the *Treuru* of Domesday Book. The old bor. was comprised in the parish of S. Mary on land at the junction of the Allen and Kenwyn Rts., but even in Tudor times

the township had grown beyond these narrow limits. Leland (c. 1535) mentions 'Kenwyn Strete' and 'Clementes Strete,' suburbs of T. They were not formally incorporated until 1835. The Allen is still a noticeable feature with its three bridges. Kenwyn R. runs underground through the centre of the city, but the higher portion, with the 'Leates,' forms an attractive walk to the Victoria Gardens. Lemon Street (c. 1795), named after an eighteenth-century merchant, is a splendidly planned street familiar under the name of 'Orange Street' to readers of Hugh Walpole's novels. In Prince's Street, named after the Regent, is the house of W. Lemon, the massive mahogany woodwork of which attests the magnificence of former days. Here too was born Henry Martyn (*q.v.*), the missionary philologist, commemorated in the Cathedral by the baptistery. Nearby is the site of the old Cornage Hall, where for 500 years until 1837 royal officials came to examine the smelted tin and where the Tanners' Parliament held its often stormy gatherings, and also where Wesley preached. The whole city is dominated by the cathedral, whose central tower is 250 ft. high. The anct. diocese was re-estab. in 1876, and the cathedral was the first erected in Britain since the rebuilding of St. Paul's in the reign of Charles II. The foundation stone was laid on May 20, 1880, by the duke of Cornwall (later Edward VII.). In 1903 the nave was added and the Central Tower in 1901. In 1910 the Western Towers, named after Edward VII. and Queen Alexandra, were dedicated. The Co. Museum and Art Gallery contains many paintings by John Opie (1761-1807) and by modern Cornish artists. Near the museum is the site of the Dominican Friary, of which the church was dedicated in 1259. The cattle mkt., the most important in the co., was built in 1810 on the site of T. Castle. This was the anct. Truro, but even in Leland's time it was 'now cene down' and the site 'used for a shoting and playing'. Although T. cannot be described as an industrial tn., there are some important works: gingerbread, sweets, pottery, pitchers, knitted goods, electrical goods, and motor-car bodies. Notable schools are the high school for girls founded in 1880 by Bishop Benson; the Cathedral School for boys founded in 1549 or earlier, as the Truro grammar school; and the Truro School founded 1880 by Dr. Osborn, a leading Wesleyan Methodist. Pop. 26,200.

**Truro, tn.** on the Cobequid Bay, Nova Scotia, Canada. It is an industrial centre, noted for hats, caps, hosiery, milk products, and lumbering and lies in the heart of an agric. area. It has a number of modern educational buildings. Pop. 10,300.

**Trust, see under HERNIA.**

**Trust Companies, see TRUSTS (COMMERCIAL).**

**Trustee Savings Banks, see under SAVINGS BANKS.**

**Trusteeship Council, council of the United Nations (U.N.), provided for under**

the Charter of the U.N. to safeguard the interests of the inhab. of ters. which are not yet fully self-governing and which may be placed under it by individual trusteeship agreements. Its estab. was ensured on Dec. 14, 1946, after the General Assembly of the U.N. had approved eight trusteeship agreements submitted by the administering nations (in brackets): *New Guinea* (Australia); *Ruanda-Urundi* (Belgium); *French Cameroons* and *French Togoland* (France); *Western Samoa* (New Zealand); *British Cameroons*, *British Togoland*, and *Panangyika* (United Kingdom); a ninth agreement was afterwards approved concerning *Nauru* (admin. by Australia on behalf of herself, New Zealand, and the United Kingdom). Another agreement for a 'strategic area' was submitted, and approved by the Security Council in Apr. 1947. It concerned the former Jap. mandated is., *Marshalls, Marianas, and Carolines*. The T. C. consists of members administering trust ters.; permanent members of the Security Council that are not administering trust ters.: China, U.S.S.R., and 4 members elected for 3-year terms by the Gen. Assembly (Iraq, Philippines, Mexico, and Costa Rica), to ensure that the total number of the T. C. is equally divided between those members of the U.N. which administer trust ters. and those which do not. The responsibility for exercising the functions of the U.N. respecting trusteeship in ters. not classed as 'strategic areas' are vested in the General Assembly; for 'strategic areas' in the Security Council. The functions of the T. C. are to consider reports from the administering authorities; to accept and examine petitions, to make periodic inspection visits; and to check conditions in the ters. with an ann. questionnaire on the political, economic, social, and educational advancement of the inhab. Decisions of the Council are made by a majority of the members, each having one vote. In addition to the Trusteeship System, the Charter of the U.N. contains a declaration in which those members of the U.N. which administer or may in the future administer non-self governing ters. recognise the principle that the interests of the inhabs. of these ters. are paramount. Periodic visiting missions were sent out to W. Samoa in 1947; to E. Africa in 1948; and to W. Africa in 1949. The fourth General Assembly's (Dec. 1949) decision to demand information from colonial Powers on their non-self-governing ters. was unjustified. Nothing in the Charter supports the demand, and the attempt to make Article 73A (under which members administering such ters. or colonies have undertaken to transmit regularly to the Secretary-General information relating to economic, social, and educational conditions in those ters.), the basis of a new kind of trusteeship system is clearly beyond the constitutional powers of the Assembly. *See further under COLONIAL TRUSTEESHIP.*

**Trust Investments, are regulated by the Will or Settlement, and by the consolidating Trustee Act, 1925 (Part I.).**

A trustee may invest any trust funds in his hands, whether at the time in a state of investment or not, in any of a number of investments specified in section 1 of the Act. These include: parl. stocks or public funds, or gov. securities in the United Kingdom; real or heritable securities in the United Kingdom, including the security of a charge on freehold land by way of legal mortgage; stock of the Bank of England or the Bank of Ireland (all Bank of England stock has been transferred to the Treasury pursuant to section 1 of the Bank of England Act, 1946. The Bank of Ireland stock is retained in the Act, but stocks of the Republic of Ireland are excluded); India 7%, 5½%, 4½%, 3½%, and 2½% stock (but reference should be made to the Gov. of India Act, 1935 section 165 and to the India Independence Act, 1917 section 18, as to the interpretation of pre-existing law); securities the interest of which is for the time being guaranteed by Parliament (including, under an Act of 1945, the Parliament of N. Ireland); consolidated stock created by the Metropolitan Board of Works, or by the L.C.C., or debenture stock created by the Receiver for the Metropolitan Police Dist., or Metropolitan Water stock; the debentures or preference stock of any railway company in the United Kingdom incorporated by special Act of Parliament and having during the previous ten years paid a dividend at the rate of not less than 3% on its ordinary stock (under the Transport Act, 1917, provision is made for the replacement of securities of railway companies by Brit. Transport stock); debenture stock and 'B' annuities of Indian railways (subject to the effect of the India Independence Act, 1947); debentures, or guaranteed or preference stock of any company in the U.K., estab. for the supply of water and incorporated by special Act or Royal Charter and having paid a dividend of 5% for the last 10 years, inscribed stock issued by any municipal bor. having a pop. of over 50,000, or by any council; municipal stocks issued under Act of Parliament or provisional order, and stocks authorised under the Colonial Stock Act, 1900. Trustees may also invest in any security issued under the National Loans Acts, 1939-45, and section 1 of the Miscellaneous Financial Provisions Act, 1946. Securities created and issued to raise money under section 12 (4) of the New Towns Act, 1946 or under section 66 (3) of the Town and Country Planning Act, 1947, are to be deemed for all purposes to have been created and issued under the National Loans Act 1939, and are, accordingly, trustee securities. Trustees, unless expressly prohibited from so doing, may invest in bearer securities which if they were not payable to bearer would have been authorised securities. Most modern wills and settlements allow of a wider range than either the Act of 1925 or the Rules of Court, and so long as the trustee keeps within that range and acts in good faith he is protected. The investments authorised by the High Court are those stated in the Rules of the

Supreme Court (Order 22 rule 17). They only require of the stocks named in section 1 (1) (9) of the Act that a dividend shall have been paid on ordinary stock or shares for ten years before the date of investment. It should be noted that even when the Will or Settlement contains a list of authorised investments the trustees may also invest in the securities authorised by the Trustee Act, 1925, unless expressly forbidden to do so (*Re Warren, Public Trustee v. Warren*, 1939); and further, that when specific investments are settled there is no power to realise the same and invest the proceeds in investments authorised by the Act (*Re Prett, Barrow v. McCarthy*, 1943). Trustees who have held land on trust for sale may invest the proceeds in the purchase of land so long as such proceeds remain identifiable (*Re Wellsted's Will Trusts, Wellsted v. Hanson*, 1949).

**Trusts and Trustees.** *Legal.*—A trust is an 'equitable obligation binding a person (who is called a trustee) to deal with property over which he has control (which is called the trust property) for the benefit of persons (who are called the beneficiaries) of whom he may himself be one, and any one of whom may enforce the obligation.'—(Underhill on *Trusts and Trustees*). Legal historians for the most part trace the development of trusts in Eng. law through the doctrine of *uses*. In all probability the Chancery lawyers, who were ever indebted to the principles of civil law, borrowed the whole idea direct from the Rom. *fiduciarius* (*see* *ESTATE*) are not now ignored or challenged by the common law (*see* *ESTATE*), but in construing a trust or considering the powers or duties of trustee and beneficiary respectively it is necessary to observe that the trustee usually has the legal ownership of the trust property, subject, of course, to his fiduciary obligations; while the beneficiary has only the *equitable* ownership, though such ownership centers upon him the beneficial right to the income or other profits accruing from the property. Any act or default on the part of a trustee which is unauthorised either by the terms of the instrument creating the trust or by law is called a breach of trust, in respect of which the beneficiary is entitled to sue for damages. The Trustee Act, 1925, which consolidates certain of the previous statutes relating to trustees, re-enacts the statutory provision of the Judicial Trustee Act, 1896, whereby the court can exonerate a trustee who has committed a breach of trust but has acted honestly and reasonably (Section 29). The appointment of a Public Trustee may be made either by the creator of the trust, by the person having by the Trustee Acts or by the trust instrument power to appoint new or additional trustees when required, or by the court. The Public Trustee is forbidden by the Public Trustee Act, 1906, to accept the responsibility of certain trusts; *e.g.* trusts exclusively for religious or charitable purposes, trusts for the benefit of creditors, and trusts involving the manage-

ment of a business. Where there are no trustees available for the purpose of vesting in them land which requires a legal owner under a Settlement, the court may, under the Law of Property Acts, vest the land in the Public Trustee on the statutory trusts, in which case the Public Trustee may not charge fees or act unless requested to do so. Trusts are said to be: (a) *Express*, when created intentionally by the act of the settlor. Express trusts are generally created by deed or will. They are the common means whereby owners of property provide for their issue on their own death or settle property on their children at marriage. (b) *Constructive*, when, though the legal title to property is in one person, the court will decree that he ought in equity to hold the property subject to the beneficial enjoyment of another. (See CONTRACTS, and FRAUDS, STATUTE OF.) All property, real (*q.v.*) or personal, whether situate at home or abroad, and whether in possession or in action (see CHOSE IN ACTION), remainder (see LAND LAWS), reversion (*q.v.*), or expectancy, may be made the subject of a trust, unless the law has made it inalienable (*e.g.* pensions and salaries to public servants), or being land the tenure (see TENURE) is inconsistent with the trusts sought to be created. The expressed object of the trust must be lawful or it will be held void; hence trusts conducive to immorality or fraud, trusts restricting the power of alienation of the beneficiaries' interest, are void (see also RESTRAINT OF MARRIAGE; PERPETUITY; TRUSTEES). Trusts of land must for the most part be evidenced by writing signed by the settlor. Trusts of personal property may be created orally, though it would be highly inadvisable not to use written instruments.

Trustees may employ agents, and are not liable for their default, but they should not allow money or property to remain in the hands of a solicitor or banker longer than is reasonably necessary to enable him to pay or transfer it to the trustees (Act of 1925, Section 23); but under Section 11 of the Act of 1925 the trustee may leave money with a banker pending investment. A trustee who is going abroad for more than a month may delegate his trust to an attorney provided the latter is not his sole co-trustee, but he will, notwithstanding, remain liable for the default of the attorney.

Previously to the Act of 1925, the appointor of new trustees could not appoint himself, but he may now do so, so that now the tenant-for-life under a Settlement (*q.v.*) may appoint himself trustee of the Settlement. The Court may appoint new trustees 'whenever it is expedient' and there is difficulty in doing so without its help, *e.g.* where the trustee is a convict, lunatic, or bankrupt, or, being a corporation, has been dissolved. The power of advancing capital money to the persons entitled absolutely or contingently on reaching any specified age, or on the concurrence of any other event, may extend to as much as one-half of the capital in the case of personal settle-

ments, but no advancement may be made so as to prejudice any person entitled to a prior life or other interest, whether that interest be vested or contingent, unless such person, being of full age, gives his consent.

*Trust Corporation* is defined by the Trustee Act of 1925 to mean the Public Trustee or a corporation appointed by the court in any particular case to act as trustee, or a corporation entitled, under rules made pursuant to the Trustee Act, 1906, to act as 'custodian trustee.' Recent acts have extended the powers and facilities given to such corporations. These corporations are generally banks and insurance companies, but, by the Law of Property Amendment Act, 1926, there are included the Treasury solicitor and official solicitor, and any person holding any other official position presented by the Lord Chancellor, the trustee in bankruptcy, and also certain charitable corporations. Recent legislation has extended the powers of such corporations; *e.g.* they may give valid receipts for the purchase money of land (Trustee Act, 1925, Section 14). Experience shows that banks and insurance companies have been ready to assume these privileges and to accept such trusts either directly or through companies formed by them for the purpose; and indeed it is possible to see in such corporations the natural and appropriate substitute for the gratuitous trustee. Express provision for the remuneration of the trustee corporations can be made in the instrument appointing them. If the court appoints the corporation it may fix its remuneration. See Sir A. Underhill, *Laws relating to Trusts and Trustees* (9th ed.), 1939 (with supplement), 1917; T. Lewin, *Practical Treatise on Law of Trusts* (11th ed.), 1939 (with supplement), 1916.

**Trusts (Commercial).** T. is the term somewhat loosely applied in the business world to a large financial and industrial combination. The aim of Ts. is partly monopolistic. In essence they are really the union of separate corporations or companies trading in the same or similar commodities. The shareholders of the separate companies taking part in the union surrender their holdings to a board of trustees and in return for such surrender receive a T. certificate setting forth the value of their holding in the T. The trustees now virtually become a board of directors controlling and directing the different members of the T. as one single whole. It will be at once patent that by arrangements of this nature much in the way of competition is eliminated, overhead charges are reduced to a minimum, expenses of production and distribution are curtailed. If there were no other factors operating, the public would stand to gain in the long run from the workings of these combinations. But too often, when competition has been successfully eliminated, the T. is more concerned in increasing profits than in passing on to the public the benefits which have accrued after a successful period of trading. Of course there is a

limit to which prices may be raised through Ts., as rival concerns would not be long in establishing themselves. The first of these modern Ts. was that estab. in the U.S.A. by John D. Rockefeller (q.v.), who in 1882 formed the Standard Oil Trust with a capital of \$100,000,000. This T., at its inception, was able to control 85 per cent. of the total output of refined petroleum in the U.S.A. In 1911 the U.S. Supreme Court ordered its disintegration. It has been realised in the U.S.A. for many years that Ts. are a potential danger to the community. Laws have been passed by Congress, including the Sherman Anti-Trust Act of 1890, and different states in the Union declaring them illegal and forbidding their promotion. But the T. has come to stay in some shape or form and is characteristic of modern business and finance. See also CARTEL; COMBINE; CAPITAL AND CAPITALISM; *History of Capitalism*; MONOPOLIES; TAFT, WILLIAM HOWARD.

**Truth**, in philosophy, is defined by Jacques Maritain as a word which expresses, as it really is, the speaker's thought, and a true thought represents, as it really is, the thing to which it refers. T. in the mind therefore conforms with the thing. The degree of T. depends upon our organs of knowledge. The search for T. and especially criticism of T. form a branch of philosophy called epistemology (q.v.). Nietzsche regarded T. as a form of fetter which the world must, to know itself, break asunder, while at the opposite pole are the sceptics, who challenge the possibility of T. in itself. Famous sceptics include the anc. Gks., Pyrrho, Arcesilas, and Carneades, and Montaigne and Sanchez in the sixteenth century, with David Hume in the eighteenth century. Later philosophers who challenged intellect's reason as capable of finding T. include Rousseau, Fichte, Schopenhauer, Bergson, and William James. They claim that T. is to be found rather in the will, in feeling or in action. Rationalists hold that T. is easy to attain, and undertake to bring all things within the comprehension of reason which is competent to attain T. independent of reality, or of God. They claim to achieve perfect wisdom by natural powers, and reject the necessity of Divine revelation. Descartes, Malebranche, Spinoza, and Leibniz are among them. The school of Aristotle and St. Thomas Aquinas teach that T. is neither impossible nor easy to attain. It is thus opposed both to sceptics and rationalists. Kant, the founder of subjective philosophy and his successors Schelling and Hegel, defied the human subject of knowledge, and rationalism and scepticism appear to find common ground in their anti-intellectualism. Such philosophy is termed modernist. See the works of the philosophers mentioned above; also KNOWLEDGE; PHILOSOPHY; METAPHYSICS.

'**Truth**,' Eng. (London) weekly paper founded in 1877 by Henry Labouchere. Notable for its fearless and effective exposure of frauds, T. devotes special

attention to financial, military, society and political topics.

**Trutnov** (Ger. *Trautenau*), tn. of Czechoslovakia, on the Upa. It is chiefly engaged in the linen industry. Pop. 16,200.

**Tryfan**, 3010 ft., mt. in N. Wales, noted for its striking pyramidal appearance and general steepness of incline. The best view of it is from the Capel Curig side. It stands above lake Ogwen, with Snowdon to the S.W., separated from it by the Glyders and the Llanberis pass. The upper half of the E. and S.E. faces is a precipice which offers some of the best and safest rock climbing in Britain. The foot of the climbs can be reached in a few hrs. either from Pen-y-pass or Ogwen. The prin. features are the N., central, and S. buttresses, with the intervening N. and S. gullies, and the climbs all lead to the rocky summit ridge capped by its twin 10-ft. monoliths, Adam and Eve.

**Trygon**, see STING-RAYS.

**Trypanosomes**, *Trypanosomiasis*, see SLEEPING SICKNESS, Tsetse FLY, and TROPICAL MEDICINE.

**Tsad**, see CHAD, TCHAD, OR TSAID, LAKE.

**Tsagris**, *Kleomenis-George* (b.1889), Gk. writer, b. in Nauplia. He studied at Athens Univ. where he received the degree of Doctor of Law. His prose possesses a poetic quality based on deep emotion and thought. His masterpiece is the prose poem, *Hardas* (1925), and other works include *Rösi* (1916), *Spring Ramble* (three lyric novels, 1919), and *Blue Narcissus* (1926).

**Tsaidam** (or *Tsaidum*), Central Asian region in the prov. of Chinghai, China, lying between N.E. Tibet and W. of the Koko-nor, formerly the bed of a vast salt lake.

**Tsana, Lake**, see under ARVSSINIA.

**Tsar**, or *Czar*, title of the Russian emperors; the wife being called 'Tsarina.' It has a common origin with the Ger. 'Kaiser' in the Lat. *Cæsar*.

**Tsaritsyn**, see STALINGRAD.

**Tsarskoe Selo**, see PUSHKIN.

**Tsavo National Park**, see under KENYA COLONY AND PROTECTORATE, *Divisions and Physical Features*.

**Tschaikowsky** (or *Tchaikowski*), **Peter Ilyich** (1840-93), Russian composer; b. in the gov. of Viatka, began life in the civil service, but, at 23, resigned and, in poverty, took up a musical career. Settling in St. Petersburg (Leningrad) in 1850 he joined Anton Rubinstein's new Conservatoire in 1852. T. early came under the influence of Rimsky-Korsakov and Balakiref, but he represented the more virile and excitable aspects of the Russian temperament, and, unlike his elder contemporaries, did not use national folk tune as his material nor adopt a Russian literary basis for his composition (*Scholes*). From 1866 to 1877 he was prof. of harmony at Rubinstein's Conservatoire at Moscow. An unhappy marriage then disturbed his life for a time, but in 1879 he was freed from the necessity of teaching, and withdrew to the country and devoted himself to composition.

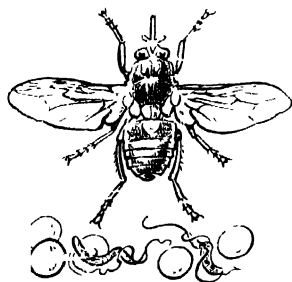
As a composer T. shows remarkable

versatility: he attempted operas, e.g. *Voyevode* (1869). *Eugene Onegin* (1879), *Maid of Orleans* (1881), symphonies, chamber, vocal, and instrumental music, and in every branch he accomplished masterpieces, e.g. his 4th, 5th, and 6th symphonies, his string quartets, his piano concerto in B flat minor and violin concerto in D minor, and his splendid orchestral pieces, *Francesca da Rimini* and *Romeo and Juliet*. The earlier symphonies, while fertile in imagination, lack the heavy emotional content of the later; in the beautiful suite for string orchestra, and especially in the great piano concerto (the first) there is escape into pure romance and delight. It is in his later symphonies that his individuality finds its most characteristic expression. These reveal him as the antithesis of Beethoven. In them there is a definite mood sequence; but it is one in which struggle and sheer delight alternate, and in which the end is either a resumption of the struggle, as in the Fourth (1878), and Fifth (1889) or poignant pathos as in the Sixth (1896). Though he owed much to W. influences his genius was essentially national, and his music expresses all the mingled fire and melancholy of the Slavonic temperament. See *Lives by M. Tschalkowsky* (trans. by R. Newmarch), 1906; E. Evans (Master Musician Series), 1935; and G. Abraham, 1944.

**Tschudi, Aegidius, or Schudy, Gilles** (1505-72), Swiss chronicler, became 'landammann' or chief magistrate of his native state. His *Chronicon helveticum*, 1501-1470, in spite of its unreliable character, remains a groundwork of Swiss hist., containing one of the prim. accounts of Wm Tell (q.v.).

**Tsetse Fly**, fly belonging to the same family (Muscidae) as the common house flies, two species of which, *Glossina*

boasts. *G. palpalis* has entirely different habitats from *G. morsitans*, the former breeding mostly in riverine bush, the latter in savannah country, and control measures therefore differ in each case, though the object in both cases is to break the contact between the T. F. and man. The T. F. is similar in appearance to the house-fly, but has a very long and slender proboscis. The wings are more leaden and more opaque, and the thorax is chestnut with four black longitudinal stripes. The abdomen is yellowish-white with a black spot on four of the five segments. T. F. is widely distributed throughout Central Africa, infected areas being found in the W. coast, in the Belgian Congo, in E. Africa, and as far S. as the Rhodesias. New patches frequently occur, as migrations of fly are frequent in areas in which it is hitherto unknown. The same family of flies conveys both human and animal disease and not only occasions widespread human suffering, but renders it impossible to keep cattle and other livestock in large areas. An epidemic of trypanosomiasis along the shores of Lake Victoria Nyanza early in this century is said to have caused the death of a quarter of a million people. The Royal Society sent out two commissions to Uganda to investigate the disease. Sir David Bruce, a member of the first commission, concluded that the disease was due to infection with a trypanosome. Prof. F. K. Kleine found that the trypanosome underwent cyclical development in T. F. From these and other researches it is commonly agreed that human trypanosomiasis is due to the infection of man with either of two species of trypanosome, *T. gambiense* or *T. rhodesiense*; and that these trypanosomes are conveyed by certain species of T. F., either by direct transmission of a trypanosome from one infected person to another, or by cyclical transmission, after the trypanosome has undergone a certain part of its cycle of development in the tissues of the T. F., the latter being the more usual method. One theory of the development of human trypanosomiasis is that both parasites (*T. gambiense* and *T. rhodesiense*) are altered forms of *T. brucei*, the cattle and game trypanosome (other virulent forms of cattle or game parasite are *T. congolense* and *T. vivax*) which normally dies when introduced into man. Expert opinion holds the view that wild animals are undoubtedly a reservoir for *T. rhodesiense*, which causes a more acute disease for man than *T. gambiense*. Remedies for dealing with the T. F. include the killing of game to limit the range of infection and the burning of bush to exterminate the fly, but in the latter case the resulting deforestation may form the starting-point of new soil erosion. As the result of further research begun in 1941 and experimentation with a new drug then known as M.7555, a drug named Anticid was eventually discovered which gives immunity for definite periods to cattle, horses, camels, and other animals. It has been estab. that a single treatment will cure cattle of *T. congolense* and *T. vivax*



TSETSE FLY

*morsitans* or *G. smytnertoni* and *G. palpalis* are the cause of enormous loss among domesticated animals in most parts of tropical Africa. It is a bloodsucker, and though its bite is not itself dangerous, it is the means by which a parasitic protozoan is introduced into the blood, causing trypanosomiasis or sleeping sickness (q.v.) in humans or 'nagana,' i.e. fly disease, in the case of cattle and other

the two worst forms of the disease, and it has been used with success against the *T. brucei* infection in cattle, horses, and dogs, against *T. evansi* in cattle, and against *T. simiae* in pigs. See Lord Huxley, *An African Survey*, 1938; and J. Smart, *Insects of Medical Importance*, 1943.

**Tseziz**, see WENDEN.

**Tsimshians**, or **Chimmesyans**, tribe of N. Amer. Indians, now almost extinct, who dwell along the shores of the Pacific, facing the Queen Charlotte Is.

**Tsimshian Language**, see under NORTH AMERICAN NATIVE LANGUAGES. *Pacific areas*.

**Tsinan**, or **Chi-nan**, cap. of the Chinese prov. of Shantung, was the first city in the Chinese Empire in which a foreign commercial settlement was voluntarily opened by the Chinese Gov. (1906). A considerable number of foreigners and foreign institutions, including the Shantung Christian Univ., have for many years estab. themselves in it. There are many factories. T. is one of the healthiest cities in China. The pop. is estimated at 472,300 of whom some thousands are Moslems.

**Tsingtao**, city on Kiaochow (Chiao-Chow) Bay, Shantung, China. T. was leased to Germany in 1898 for ninety-nine years and a harbour and fortress were developed there by the Ger. Gov. When the First World War broke out, the harbour served as a base for Ger. raiding warships. It was blockaded by the Jap. navy and a Brit.-Jap. military force attacked it from the N. By the end of Oct. 1914 the investment had begun and the fortress capitulated on Nov. 7, 1914. Restored by Japan to China in Dec. 1922, it was taken by the Jap. in the Sino-Japanese War but restored to China after the Second World War. Kiaochow Bay is a well-protected natural harbour, 19 m. long by 15 m. wide; but for accommodation of deep-draught vessels and for berthing, breakers and dredging are necessary. The Jap. salt fields and fisheries at T. were taken over by the Salt Administration under the Sino-Jap. Agreement of 1922, and China paid Japan two million yen. Pop. (including neighbouring dist.) 753,000.

**Tsin-chow**, see CHINGCHU.

**Tso-Mapham**, see MANASAROWAR.

**Tsushima**, is. of Japan, situated S. of Korea. It is mountainous, and really consists of two is.; the uniting neck being dry only at low tide. There are also included some 40 adjacent small is. in the strait of this name in 1905, during the Russo-Jap. war, the Russian fleet was annihilated by the Jap. under Togo, and following this the Russians were driven out of Korea and Manchuria. Area 262 sq. m. Pop. 39,000. See A. S. Noviloff-Prilsoy, *Tsushima* (Eng. trans.), 1936.

**Tsuyung**, see CHUHSUNG.

**Tsyetsyn**, see QUELFART.

**Tuam**, tn. in Galway, Ire. It is the seat of an Anglican bishop and a Rom. Catholic archbishop. It has a beet-sugar refinery. Pop. 4700.

**Tuaregs**, tribe of Berber Arabs, inhabi-

ting the region of the Sahara. By complexion they are a 'white' race and their main characteristics are dark hair and hazel eyes. They are a warlike tribe and adhere to the Mohammedan religion. See BERBERS.

**Tuatera**, see SPHENODON PUNCTATUS.

**Tuba**, An anct. Rom. military instrument of the horn type; now the bass instrument of the horn family, used in the orchestra as the bass of the brass instruments and more often associated in 1-part harmony with the trombones than with the horns, though its tone is nearer the latter. The instrument, owing to its 3 or 4 valves, controls a complete chromatic scale from F an octave below the bass-clef staff to c. F an octave above it.

**Tubercle and Tuberculosis**. Tubercles which characterize the diseases classed under tuberculosis are the result of the attack of the tubercle bacillus and the defensive operations against it. The bacillus is a non-mobile organism, rod-like, with rounded ends. Koch, 1882, announced his success in isolating it and cultivated it on coagulated blood-serum. The Ziehl-Neelsen method of staining with acid fuchsin and methylene blue is practically specific and is convenient, giving red bacilli on a blue background. Much's method of staining is under certain conditions superior to the Ziehl-Neelsen method in that it reveals the presence of more tubercle bacilli in the tissues. In this method, acid methyl violet is followed by Gram's iodine, the preparation being subsequently treated with nitric acid, hydrochloric acid, and finally with a mixture of acetone and alcohol until all structures other than the tubercle bacilli are decolorized. The bacillus of the mammalian disease lives between temps. of 29° C. and 42° C., flourishing best at 37-38° C. It is destroyed, generally, after 4 to 6 hours at 55° C.; 15 min. at 65° C.; 5 mins. at 80° C.; 2 mins. at 90° C.; and in less at boiling point. Its resistance to desiccation is very marked; if not exposed to sunshine it retains its virulence for as long as six months; exposure in direct sunlight kills it in a few hours.

Metchnikoff studied the effect of the attack in the human body, determining the ingestion of the bacillus by leucocytes and the cells of connective tissue and of the lining of the alveoli. These phagocytes throw off antitoxins, or absorb the bacilli, after they have been acted on by opsonins (Sir A. Wright). If the attack succeeds, leucocytes are destroyed and form pus. Grey tubercle is the first and most characteristic lesion; it varies in size from a pin point to a small pea, and is slightly translucent, consisting of small and large cells containing bacilli. These tubercles gradually change to opaque, slightly granular, dry, and friable yellow tubercles which coalesce, increasing in size. Blood-vessels are found in neither variety, but the lesions produce inflammation in surrounding vascular tissue, often producing suppuration and abscess. The change from grey to yellow is due to caseation,



originating in the centre of the grey tubercle and spreading till the whole has the appearance and consistence of cheese; the caseous mass may then calcify and the disease be stopped; in small tubercles the change may be to a mass of fibrous tissue. The deposition of lime salts encloses the bacilli and kills them. In the case of suppuration and abscess, discharge leave cavities with weakened walls open to further attack and disease spreads. The leucocytes themselves may migrate and spread infection.

Tuberculosis is infectious, and infection has been generally attributed to other human patients, or to animals used for food, especially cattle and pigs. The chief means are inhalation of dried expectoration particles, or of wet particles, as in kissing or during coughing, or the ingestion of tuberculous milk or other foods. The question of identity of tuberculosis of the bovine and avian type with that of man is not yet definitely settled. Koch was against identity, and Von Behring considered bovine bacilli more virulent in man. The Royal Commission interim report of 1904, and that of the Tuberculosis Congress in Paris, 1905, lean to Von Behring's view; the final report of the former, 1911, considers identity as true for bovine and porcine, but not for avian tuberculosis. It is now generally estab. that the bovine and human forms of bacilli are different and that whereas the bovine form does not cause phthisis in human beings, it may cause intestinal and other forms of human tuberculosis. The general tenet is that infection from milk is prevalent among children, and otherwise infection is due to overcrowding, particularly of bedrooms, and neglect of isolation.

Attention to these and the innumerable improvements due to greater prosperity in England have led to a fairly steady decrease in phthisis. After a steady fall for many years after the beginning of the century, the number of deaths from tuberculosis of all forms in Great Britain showed a sharp rise at the beginning of the war, 1914 being the peak year. There were 32,845 deaths from this cause in 1941 as compared with 29,149 in 1939. In England and Wales the number of deaths have declined since 1941, there being 21,983 deaths in 1948 compared with 28,670 in 1941. In Scotland however, although the deaths from tuberculosis of all forms have decreased since 1941, this is due to a marked reduction in the number of deaths from non-respiratory tuberculosis (generally attributed to a cleaner milk supply). Deaths from respiratory tuberculosis in Scotland actually reached their peak in 1948, there being 3117 deaths from this cause in that year, compared with 3117 in 1941. In 1949 there was however, a fall to 3075 deaths. The number of tuberculosis notifications have shown no marked tendency to fall in the United Kingdom, but it is believed that this may not indicate an increase in incidence of the disease, but an improvement in methods of detection, including the increased use of mass-radiography.

The disease appears to act chiefly between the ages of twenty-five and forty-five. Among the causes of susceptibility to infection, physical over-exertion stands high; malnutrition and alcoholism also play a large part. Influenza, whooping cough, measles, and to a less extent scarlet and enteric fevers predispose to success of attack. Hereditary transmission is, of course, unproved, though intra-uterine infection is known; hereditary 'predisposition' is probable. The disease being so widespread, so distributed in age and sex, its latent period so indeterminate, statistics are extremely difficult to collect correctly, and much of the subject is still *sub judice*. No connection with climate can be said to be estab. nor yet with soil; a retentive soil, without drainage, is probably unfavourable as for many other diseases. General tuberculosis is the form distributed over many parts of the body; when confined to the lungs, phthisis, consumption, and pulmonary tuberculosis are the terms used. Tuberc. mesenterica or tuberculous peritonitis is applied to the affection of the peritoneum or abdominal lymphatic glands; tuberculosis of the membranes of the brain is known as tuberculous meningitis or acute hydrocephalus. Lupus, infection taking place probably through skin wounds, is tuberculosis of the skin; caries, that of the bone; scrofula, that of the lymphatic glands of the neck. In miners' and knife-grinders' phthisis tuberculosis is possibly only a superadded cause of death. Koch in 1890 announced his tuberculin treatment by infection, but it has not met with much success, and is undoubtedly difficult to prescribe in individual cases; it has often been found to aggravate the disease. It is, however, useful as a means of diagnosing T. in cattle, and is used for the same purpose (the Mantoux test) in human beings. Acquired immunity against tuberculosis may be gained by inoculation with living attenuated tubercle bacilli. Calmette attenuated bovine tubercle bacilli by culturing them for years in a medium containing bile. Immunisation by the attenuated Bacillus Calmette-Guérin (known as B.C.G.) was being given clinical trials in Gt. Britain in 1949. Spahlinger's (*g.v.*) treatment by injection with 'antigen' was given a favourable reception by the medical profession in 1932. The administration of such a vaccine may, like the tuberculin treatment, be extremely dangerous and should be carried out only by an experienced worker. Such immunity lasts only for a year or two. Treatment consists in isolating the case, good nutritive diet, freedom from worry or anxiety, an open-air life with as much sunshine as possible. The Eisen light has proved very successful in lupus. In tuberculosis of the bone, amputation is generally resorted to, though scraping is sometimes successful. The treatment of pulmonary T. is dealt with under Phthisis. Streptomycin is useful in the treatment of some forms of T., e.g. tuberculosis, meningitis, and military T. (see PENICILLIN).

It is rather in the direction of prevention that the disease is being overcome. More cleanly habits, especially the abolition of expectoration; sanitary dwellings, not crowded nor with insufficient air space indoors, particularly less crowding of bed- and sick-rooms; isolation, and better social conditions in general, are producing most effect. The extermination of tuberculous food animals and prevention of sale of such contaminated food are considered necessary and desirable. Practically no herd of cattle in the Brit. Isles is free from tuberculosis; pasteurisation of milk is at best a temporary expedient; the real remedy lies in the elimination of all cattle which react positively to the tuberculin test. All these points call for individual sense of responsibility rather than State action, but the scourge has reached such dimensions as to need the latter. In 1913 a departmental order made all cases of tuberculosis, public or private, notifiable by medical practitioners. Sanatoria were also estab. in connection with the Insurance Act, though even in 1949, after a year under the National Health Act, the accommodation was still inadequate. In 1905 an International Congress was held in Paris. In Great Britain the Public Health regulations of 1930 require, within two days, notification to the local medical officer of health, and empower local authorities to isolate advanced cases. See BACTERIA, LUPUS, MASS RADIOGRAPHY, PHTHISIS, and VACCINE-THERAPY. See W. G. Wilkinson, *The Principles of Immunity in Tuberculosis*, 1926; F. E. Gunter, *Tuberculin in Practice*, 1928; W. B. Tomson, *Some Methods for the Prevention of Tuberculosis*, 1929; W. G. Savage, *Prevention of Human Tuberculosis of Bovine Origin*, 1929; L. S. T. Burrell, *Recent Advances in Pulmonary Tuberculosis* (3rd ed.), 1937; J. A. Myers, *Tuberculosis among Children* (2nd ed.), 1938; J. Maxwell, *The Care of Tuberculosis in the Home*, 1943; and S. R. Gloyne, *Social Aspects of Tuberculosis*, 1944.

**Tubercles, Root, see ROOT.**

**Tuberculosis, in Cattle, see under CATTLE.**

**Tuberoses, see POLIANTHES.**

**Tubes.** Steel T. for a wide variety of engineering uses can be classified in two main headings: Seamless or weldless, and welded. The first step in the manu. of seamless T. is the introduction of a mandrel or point over which the billet is rolled to form a cylindrical shell. The operation is known as piercing. The pierced billet is reheated to bring the metal to a forging temp. and passed to a plug rolling mill where the diameter and wall thickness are further reduced while the length is increased. In making pipes over 16 in. in diameter the rolled tube after being reheated is delivered to the rotary mill. In this mill the diameter is increased and the wall thickness reduced to approximately finished dimensions before delivery to the rolling mill, which burnishes the inside and outside surface and tones up the tube, which is slightly oval in shape as it leaves the plug rolling mill. In the

sizing mill the pipe, either cold or reheated if necessary, is passed over two or more sets of sizing rolls where the final reduction gives a uniform diameter and roundness throughout the pipe length. The pipe is now cooled off, strengthened if necessary, inspected, and finally cut to the required lengths.

Welded tube is produced from flat strips of the thickness of tube wall required and of just slightly greater width than the circumference of the finished product. The strip is reheated to a welding temp. and bent round by specially designed rolls and the two ends compressed together so that they weld up into a tube. Welded tubing has the advantage that a more uniform wall thickness can be obtained, free from drawing marks. The manu. of welded T. is quicker and less expensive than the production of weldless.

Although the largest tonnages of steel tube are made from steel containing about .06-.10 per cent. carbon, .35 per cent. manganese, sulphur, and phosphorus below .5 per cent. of the running type, steels of .30 to .55 per cent. carbon are also used, and where greater strength is required a high carbon nickel steel can be supplied. It is now possible to obtain commercial tubing of high tensile strength for automobile and aircraft purposes in a wide range of alloy steels. These steels include nickel, nickel chromes, chromium, stainless, etc.

**Tubes, Pneumatic, aæ** used for the conveyance of letters, telegrams, or small parcels. The object to be conveyed is placed in a gutta-percha or steel cylinder which is driven to its destination by suction or compressed air. The systems range from those used in some departmental stores to the more elaborate street tubes installed at large Post Offices and at the War Office in London.

**Tubet, see TIBET.**

**Tübingen**, tn. of Württemberg, Germany, on the R. Neckar, on the outskirts of the Black Forest. The chief buildings of interest are the tn. hall, the Stiftskirche, the Rom. Catholic cathedral, and the castle of Hohentübingen on a height overlooking the tn. It was here that the Tübingen school of theology had its origin. There is a noted univ., founded in 1477. The tn. is a manufacturing centre, notably for chemicals, textiles, and engineering products. Pop. 32,000.

**Tubuai, or Austral**, archipelago in the Pacific Ocean, situated S. of the Society Is. The chief products are oranges, bananas, cotton, sugar, and tobacco. Pop. 3,600.

**Tucson**, co. seat of Pima co., Arizona, U.S.A., and the largest city of the dist. T. has grown with great rapidity during recent years. It is an important trading centre, particularly for local farming products. The climate is dry, and irrigation farming is carried on. Cotton, alfalfa, and grain are produced. Here are situated the Univ. of Arizona founded in 1885; the State School for the Deaf and Blind, the State Agric. School, and St. Joseph's Academy. In 1900, T. was made the see of a Rom. Catholic bishop.

Mining is an important industry and T. has an experimental station of the U.S. Bureau of Mines. T., owing to its dry climate, is a favourite resort for winter visitors. Pop. 36,800.

**Tucuman:** 1. Prov. of Argentina. The W. part is mountainous and covered with forest. There are mines of gold, silver, and copper. The chief products are cereals, fruit, tobacco, and sugar. Area 8817 sq. m. Pop. 604,500. 2. Cap. of the above prov., has a cathedral and a univ. founded in 1912, and Jesuit college. It is the busiest tn. in the north of Argentina and is chiefly engaged in sugar refining and distilling. Here in 1816 was held the first Congress of the Republic, when the independence of Argentina was declared. Pop. 158,000.

**Tudur, see Tudor.**

**Tudor**, surname of an Eng. dynasty, founded by a Welshman, Owen T., who married Catherine, widow of Henry V. He was the father of Edmund, earl of Richmond, who married Margaret, great-granddaughter of John of Gaunt. Their son usurped the throne and as Henry VII. reigned from 1485 to 1509. The other T. monarchs were: Henry VIII. (1509-47), Edward VI. (1547-53), Mary (1553-58), Elizabeth (1558-1603).

**Tudor Style**, in architecture, a somewhat indefinite term, covering the Eng. architecture of the reigns of Henry VII., Henry VIII., Edward VI., Mary, and Elizabeth. Though not a variety of Gothic, it shows Gothic influence in many ways. Its chief product was the Tudor manor. The style is a form of perpendicular of which the Tudor arch and the Tudor rose decoration play an important part. It is a more domestic style than the Decorative Gothic which it replaced with its larger windows and taller, thinner pillars.

**Tuff**, term which includes the finer kinds of volcanic detritus. Beds containing large blocks of ash are called agglomerates.

**Tufa, Calcareous**, see CALCAREOUS.

**Tug**, vessel equipped with strong hawsers and towing gear for use in salvaging damaged ships. In size the large ocean-going T. is somewhat similar to the fishing vessel. It is 198.3 ft. in length; tonnage, 793 gross; has no loading capacity but carries fire and salvage pumps. The ocean-going T. may attain a speed of 17 knots (without tow). It carries powerful pumps to enable its crew to clear the water from a ship's hold. Its hawsers and towing gear are strong enough to bring a 12,000-ton tanker across the ocean. The smaller ship-handling Ts. normally do not operate far outside the harbour limit. There are even smaller Ts. on the R. Thames, which are used exclusively for handling barges. See further under SALVAGE, *Salvaging Ships*.

**Tugela**, riv. of Natal, S. Africa, has its source in the Drakensberg Mts., flowing in a S.E. direction, past Ladysmith and Colenso, to empty its water into the Indian Ocean. At Isandhlwana and Rorke's Drift on the T., actions were fought in the Zulu war (1879).

**Tuileries, Palace and Garden of the**,

situated in the centre of Paris. Here, in 1342, a certain Pierre des Essarts possessed a pleasure house, called the Hôtel des Tuileries, because it was built in a locality outside the city where there were sev. tile-works (Tuileries). This site was chosen by Catherine de' Medici for a new palace, and the building was begun in 1566, the architect being Philibert Delorme (q.v.). The palace was burned down by revolutionaries in 1871. See monograph by G. Lenotre, 1933.

**Tuke, Henry Scott** (1858-1929), Brit. painter, b. at York, son of Daniel Hack Tuke, physician and great grandson of W. Tuke, the Quaker philanthropist. He settled in Cornwall, and was one of the later members of the 'Newlyn School' of artists. He painted mostly youthful nudes against a marine background.

**Tuke, William** (1732-1822), Eng. philanthropist and Quaker, b. at York. Pioneer in the humane and scientific treatment of the insane, he induced the Society of Friends to take this matter up, and in 1796 the York Retreat was opened. See D. H. Tuke, *Chapters in the History of the Insane*, 1882.

**Tula:** 1. Region of the R.S.F.S.R., in the S. of Moscow. It is watered mainly by the Volga and the Don, and is well cultivated. Coal and iron are found. Pig-rearing is much developed. T. and Bielew on the Oka are the chief tns. Area 12,660 sq. m. Pop. 2,050,000. 2. Cap. of above, at the confluence of the Tulitza and Upa. It is a centre of the iron and steel industry of European Russia. Iron has been mined there since the time of Peter the Great, and is used in the engineering works and iron factories near the tn. Arms and cutlery are the chief manufs. Russia leather, candles, soap, tallow, sealing-wax, paints, and woollens are also produced, and there is trade in hemp and corn.

In the Second World War T. figured conspicuously in the winter of 1941 (Nov.-Dec.) in the struggle for Moscow. See further under EASTERN FRONT OR RUSSO-GERMAN CAMPAIGNS IN SECOND WORLD WAR). Pop. 272,000.

**Tulcán**, tn. of Ecuador, cap. of Carchi prov., near the Colombian frontier 100 m. N.E. of Quito at an altitude of nearly 10,000 ft. above sea-level. It is the centre of an important stock-raising dist. Manufs. include wool, carpets, and ponchos. T. is on the new motor highway to Quito or Ibarra. Pop. 10,000.

**Tulip** (*Tulipa*), genus of plants family Liliaceae) of which one species (*T. silvestris*) occurs rarely in chalk pits in Britain. It has bright yellow fragrant flowers. The beautiful Darwin, Cottage, or May Flowering Ts. have tall, strong stems up to 2 ft. The gorgeously striped Parrot Ts. in shades of scarlet, yellow, green, and red are also a late flowering variety. Most of the florists' varieties are derived from *T. gesneriana*. The T. has an exceptionally wide range of colours. The bulbs are planted in Oct and Nov. Millions of bulbs are exported annually from Holland, and the Channel Is. also have a large export trade in Ts.

**Tulip Tree**, or *Liriodendron tulipifera*, tall Amer. tree (family Magnoliaceae) bearing large fragrant flowers which superficially resemble those of the tulip. The bud scales are formed from stipules.

**Tull, Jethro** (1674-1741), Eng. agricultural writer, b. at Basildon. He began experiments on his father's land in Berkshire and invented a machine-drill. He insisted on the importance of 'pulverising' the soil and the proper use of manure. His chief work is *Horse-Hoeing Husbandry*, which met with opposition and abuse.

**Tullamore**, mkt. tn. of Offaly, Ire., 60 m. W. of Dublin. It is on the Grand Canal, and there is wool-spinning, distilling, and brewing. Pop. 6200.

**Tulle**, cap. of the dept. of Corrèze, France. It manufs. firearms for the gov. Pop. 18,200.

**Tullius**, see CICERO, MARCUS TULLIUS, and CICERO, QUINTUS TULLIUS.

**Tullius, Servius**, sixth king of anet. Rome, 578-534 B.C., who surrounded Rome with a wall, enclosing the Seven Hills. He made an alliance with the cities of the Lat. League and estab. the *comitia centuriata*, or classification of the citizens according to wealth, giving the plebeians political rights.

**Tulsa**, second largest tn. of Oklahoma, U.S.A., and co. seat of Tulsa co., on the Arkansas R. It was founded by the Creeks, who named it for their former Alabama cap., Tallasi. Its great oil boom began on June 25, 1901, when oil was struck by prospectors from Pennsylvania. Pop. 142,200.

**Tulsi Das** (1532-1625), Brahman poet and religious reformer. His masterpiece is *Ramayana* (trans. by F. S. Groves, 1935). He taught the universal fatherhood of God and love to all creatures.

**Tumaco**, tn. and port of Colombia, standing on an is. in T. Bay almost at the most southerly part of the W. coast. It is in steamship communication with Buenaventura and Panama and exports cacao, tobacco, and tagua (*q.v.*). The tn. was largely destroyed by fire in 1917. Pop. 35,000.

**Tumbes**. 1. Prov. of N. Peru, lying between the S. shore of the Gulf of Guayaquil and the Cerros de Amotape, bordering on Ecuador. It has an area of 1590 sq. m. Pop. 29,500. 2. Cap. of the above, is situated on the R. Tumbes 70 m. N.W. of Loja. Tobacco-growing and charcoal-burning are carried on. Pizarro is said to have landed here for his invasion of Peru. T. is the point from which the Pan-Amer. Highway begins. Pop. 6400.

**Tumbrel**, or **Tumbriel**, ducking-stool used to punish scolding women in olden times. It consisted of a stool or chair at the end of a long pole, which could be swung over a pond and lowered. It was also used to punish transgressing bakers and brewers. The same name was applied to carts constructed with a tipping body, especially dung-carts, to the covered carts for tools, etc., in a train of artillery, and also to the execution carts used in the Fr. Revolution.

**Tummel**, riv. and loch in Perthshire,

Scotland. From the E. end of Loch Rannoch, the R. T. broadens into Loch T.,  $\frac{1}{2}$  m. wide, and 3 m. long. Eight m. E. of the loch are the picturesque T. Falls, where the riv. joins the Tay, 7 m. N.N.W. of Dunkeld, the Garry having joined it 1 m. below the falls. In 1945 a plan was made to divert and impound the Rts. Garry and T., Errochty Water, Bruar Water, and Loch T. to produce hydro-electric power.

**Tumour**, swelling, more particularly a new growth that is not the result of inflammation. The term was originally applied to any enlarged condition of a structure, but scientifically, a T. is a mass of cells, resembling those normally present, but differently arranged, and proliferating at the expense of the organism without serving any useful purpose. For such Ts., to avoid confusion, the terms *teratoma* and *blastoma* have been introduced. The former is a T. arising from undifferentiated cells; the latter arises from differentiated cells capable of forming only one kind of tissue. The cells of typical Ts. resemble those of the parent mass of cells; those of a typical Ts. may be so modified that it is difficult to trace their origin. The cause of such proliferation is not yet known; little can be said beyond the hypothesis that the normal processes of cell growth are disturbed by bacterial invasion or any extrinsic influences. Ts. are broadly classified into *non-malignant*, *innocent*, or *benign*, and *malignant* or *cancerous*. The essential characteristics of non-malignant Ts. are that they grow and divide without destroying or invading the surrounding cells which are simply pushed aside as the mass of the T. grows. A thin layer of fibrous tissue forms a definite boundary to the extent of the T., and if the growth be excised completely no recurrence can take place. Malignant Ts., on the other hand, tend to invade the surrounding tissues. There is no definite boundary, and the cells infiltrate into neighbouring tissues and replace the normal cells. Cancer (*q.v.*) cells may also be disseminated by means of the lymph channels to other parts of the body, giving rise to secondary or metastatic Ts. When the original T. has been excised, there is every probability of the growth recurring, and it is difficult to say at any time how far its influence has extended. Powell White classified Ts., as organomata, histiomata, and cytomata, according to whether they consist of organs, tissues, or cells. These groups are subdivided into connective-tissue Ts. and epithelial Ts., and still further as fibromata, myomata, osteomata, chondromata, etc., according to the nature of the structures involved. Adams has introduced a classification based on the embryological development of the cells. See also CANCER.

**Tumult**, see RIOT.

**Tumulus**, or **Barrow**. (From *L. tumere* 'to swell'). An anct. sepulchral mound. Tumuli vary much in construction, as well as in geographical distribution and date. There are between thirty and forty

thousand in England alone. From them the archaeologist derives much material for his study of human development. Barrows made entirely of stones are called cairns: other local names are earn, carnedd, howe, lowe, and tump. Tumuli are classified chiefly by their form, and some archaeologists go so far as to restrict the term to describe round mounds. Long barrows are of the Neolithic period, and usually cover inhumed burials. Round barrows belong in the main to the Bronze Age, and include bowl, bell, disc, saucer, ring, and pond types. In the earliest Bronze Age the burial is by inhumation, but cremation follows in the later stages. Romano-Brit. barrows have an unmistakable steep and conical outline, and in S.E. Britain usually cover the burials of wealthy merchant traders: the Six Hills at Stevenage, Hertfordshire, and the Bartlow Hills, Essex, are notable examples. In the Saxon period, there are a few large conical barrows such as *Tappa's law* which gives its name to the settlement of Taplow, Bucks., but these barrows which covered the remains of important chieftains are less frequently found than the clusters of small grave-mounds, the burial places of the ordinary people, exemplified in E. Kent. The bibliography is extremely large, but the standard work for England is L. V. Grinsell, *The Ancient Burial Mounds of England*, 1936, which gives references to other works.

**Tun** (weight), see **TON**.

**Tunbridge**, see **TONBRIDGE**.

**Tunbridge Wells**, royal mun. bor. and health resort of Kent, 5 m. S. of Tonbridge (after which it is named) and 35 m. from London, on the S. Region Railway. Its mild chalybeate springs, discovered in 1606 by Lord North, made it a popular resort in the seventeenth and eighteenth centuries. Places of interest are the covered promenade called The Pavilions, at the end of which are the springs; and the par. church of King Charles the Martyr. Since 1909 the tn. has been entitled to incorporate the word 'Royal' in its title. The tn. was also famed for its local industry of Tunbridge Ware (wood-mosaic). A co. cricket week is held here and there are golf links and other games' facilities. T. W. sands is the name given to a subdiv. of the Wealden Beds of the S. of England, varying in thickness from 150 to 100 ft. Pop. 39,000. See J. C. M. Given, *Royal Tunbridge Wells—Past and Present*, 1946, and Margaret Barton, *Tunbridge Wells*.

**Tundra**, term applied to a geographical region in N. Russia and Siberia, but now generic for all such regions, e.g. the barren lands of Canada. Primarily, it is a region which by reason of high lat. and consequent inclement climate is almost destitute of trees. The soil is completely frozen, except for a depth of a foot or two during summer, at which season the surface water forms pools, lakes, and marshes, the formation of which has been largely determined in the larger features by the ice cap extending over it during the glacial age. The vegetation

is stunted and scanty, consisting of mosses, lichens, dwarf birch, and willow, and an 'Alpine' flora. Except for the reindeer or caribou and musk-ox, the fauna consists of small furred animals, whose skins are sought by hunters and trappers.

**Tungshan**, see **SUCHOW**.

**Tungsten**, symbol W, atomic number 74, atomic weight 184, a metallic element which occurs in nature as wolfram (iron tungstate), scheelite (lead tungstate), and wolfram ochre (T. trioxide). The metal can be obtained by reducing the trioxide on charcoal with hydrogen. It is a hard grey metal (melting point about 3300° C., sp. gr. 18.7). It forms three oxides:  $WO_3$ , basic and a reducing agent;  $W_2O_5$ , blue in colour; and yellow,  $WO_2$ , which gives rise to the tungstates when treated with alkalis. Tungstic acid,  $H_2WO_4$ , is made by the action of the acids on tungstates. The chlorides of the element are decomposed by water. T. is used largely for electric lamp and thermionic valve filaments. These filaments may be made (a) by drawing tungsten rods at 2000° C.; (b) by compression of a mixture of T. powder and an organic compound, carbonising, heating, and then shaping into the required form; (c) by heating a carbon filament in the vapour of T. oxychloride and hydrogen, when T. deposits on the carbon centre. T. is also used for making ceramic glazes, fire-proofing, and dye mordants.

**Alloys**. T. alloys well with aluminium and with chromium. Well-known steels containing T. are characterised by being very strong and hard, and not losing the 'temper' when heated. They are especially valuable for high-speed cutting tools. Such steels contain T. 15–20 per cent.

**Tungun Languages**, see under **URAL-ALTAIC LINGUISTIC FAMILY**.

**Tunguragua**. 1. Prov. of Ecuador, crossed by the E. Cordillera of the Andes, bordered by the provs. of Chimborazo, Bolívar, Leon, and Oriente. The cap. is Hambato or Ambato. Area 1685 sq. m. Pop. 223,100. 2. Actúto, exclave of Ecuador, in the S. of T.S. an av. It rises to 16,700 ft. among the Apur. In Aug. 1949, the volcano erupted yes. the prov. was severely shaken by an *Schott* quake, which destroyed the tns. of Guano, Pelileo, Patate, and Pillare.

**Tunguses**, or **Evyenki**, branch of the Mongolian, or Mongolo-Tatar, race from Manchuria, which dwells in the mountainous dists. of E. Siberia and the region drained by the R. Amur. They occupy the region to the E. and W. of Yakutia, from the Yenisei to the sea of Okhotsk, lands extending into the Amur and Ussuri basins, where they are represented to-day by the Orochi and Lamuts. The T. lead a nomad existence, though some have taken up agriculture. To-day they are called by their correct national name the Evyenki.

**Tunhuang**, see under **CAVES OF A THOUSAND BUDDHAS**.

**Tunie**, Lat. name of the prin. underground of men and women, corresponding to the Gk. chiton. Women

wore the 'palla' over it, and men the 'toga.' It was of woollen material with short sleeves (if any), and reached to the knees in a man, to the feet in a woman. It was usually worn with a girdle, and was adorned with a narrow or broad purple stripe for a knight or senator respectively. The name is also applied to any short loose garment reaching from the neck to above the knee.

**Tunicata**, class of marine animals. The majority in their adult stage live a stationary life, fixed to rocks or to the sea-bottom, occurring chiefly in the form of cartilaginous or leathery sacs. Many are joined into colonies, such as the various species of Botryllus, which form richly coloured gelatinous incrustations on rocks and seaweeds. A familiar example of a solitary kind is *Ascidia mentula*, the sea squirt, which lives on muddy bottoms near the coast.

**Tuning-fork**, small instrument in the form of a fork with two long prongs invented in 1711 by John Shore. It not only retains pitch very accurately, but gives out a very pure sound free from harmonic upper partials. It is tuned to A above middle C used by orchestras as their fundamental tuning-note.

**Tunis**, cap. of Tunisia, stands on a bay of the same name, surrounded by lakes and marshes, 10 m. from the sea, and 275 m. N.W. of Tripoli. Its port is Goletta, but a channel opened in 1893 has made T. directly accessible to ocean vessels. T. is a walled tn., and its harbour is well defended. In the centre of the old tn. is the Medina, the focus of trade and industry, built mainly from the ruins of the tns. of Thunes, Carthage, and Utica. The new tn. is European and E. of the Medina, and is rather unhealthily situated. Velvets, silks, linen, and fez caps are manufactured. There are many mosques, with a Mohammedan univ. In the Great Mosque, and the houses are nearly all built of stone. Pop. 364,600.

**Tunisia**, depen. encl. of France in N. Africa, lying between the Mediterranean Sea, between the W. and Tripoli on the E. Pop. 1,000,000.

The area of 48,300 sq. m., of which a portion of the Sahara lying to the E. and S. is desert, extends towards the E. to the Red Sea. The pop. is mainly Bedouin Arabs, with a few Jews, and is about 3,159,000 (including 144,000 Fr. civilians and 841,000 Its.). The surface is mountainous in the interior. The region in the neighbourhood of the Mediterranean coast is fairly well watered and fertile, but towards the central table-land, bordering on the Sahara, the soil is very poor, and the dry climate makes cultivation difficult. The climate is continental, with shorter transition periods than in France. The greater part of T. is useless for agriculture, but the rest is fertile and the natives are hard-working. The chief industry is agriculture, the prin. products being wheat, barley, oats, maize, and sorghum, chick-peas, and potatoes, dates, almonds, oranges, lemons, shaddock, alfalfa grass, cork, pistachios, and henna. Much wine is made and olive oil is produced. Though the native wool is of an

inferior quality, the Algerian sheep have been acclimatised. The breed of horses is steadily improving, and pigs are profitable. The mineral resources are being developed, and lead ore, zinc ore, phosphates, the output of which increases yearly, and iron are worked. Lignite and particularly manganese mines are developing rapidly, and bronze is manuf. Phosphates and marble are also worked. The chief ports are Tunis, Sfax, and Bizerta, while there is good harbourage at Gabes and Susa. The native industries include spinning and weaving wool for garments, leather embroidery, saddlery, pottery, slipper-making, and matting. Tanning and silk-weaving are declining. The fisheries (tunny, sardines, anchovies) are also important, being mainly in the hands of the Tunisians, Gks., Maltese, and Its. T.'s import and export trade is done largely with France; but T. imports, mainly textiles, largely from England. Other imports are manuf. metals, hides, yarns, lumber, and cereals. T. exports phosphates, olive oil, grains, esparto grass, beans, blankets, sponges, dates, wines, and seeds, etc. The present ruler's family has been on the throne since 1705. In 1883, T. was made a protectorate of France and the gov. is carried on under the direction of the Fr. foreign office. Education is not compulsory, but schools provide for the primary education of all races.

Chief tns., Tunis (q.v.), Bizerta (pop. 39,300); Sfax (51,600); Susa (28,500); Kairouan (32,300); Gabes (22,500).

The Eighth Army and Allies advanced across the border into T. on Nov. 17 1943. By May 12, 1944, organised resistance in North-east T. was at an end. See *Further under AFRICA, NORTH, SECOND WORLD WAR CAMPAIGNS IN*.

See N. Faucon, *La Tunisie avant et depuis l'occupation française*, 1893; M. Besnier, *La Tunisie au début du XX siècle*, 1904; J. L. de Lanessan, *La Tunisie*, 1917; M. Monmarche, *Algérie-Tunisie*, 1927; W. B. Worsfold, *France in Tunis and Algeria*, 1930; and A. Violis, *Notre Tunisie*, 1939.

**Tunkers**, see DUNKERS.

**Tunja**, tn. of Colombia, cap. of the dept. of Boyacá, about 100 m. N.E. of Bogotá at an altitude of 9330 ft. above sea-level. It is one of the oldest tns. of the New World and contains some Sp. buildings of colonial days. Pop. 26,000.

**Tunnelling**. The technique of T. in rock has advanced considerably during the last few decades, particularly in methods of blasting, debris loading, and lining. The difficulties naturally increase with the size, length, and depth of tunnel but with the mechanical appliances now available no serious limitations are imposed. Granite or other hard rock presents little difficulty to modern power drills. The old method of hand drilling is now almost entirely superseded by power drilling in all tunnels of any appreciable length.

An important preliminary operation is the survey work. The centre-line of the tunnel is ranged out on the surface and a

series of shafts are sunk, from 100 to 300 yds. apart along the line. To transfer this line underground, two marks are made in the cross-timbers, in the centre-line, at the bottom of each shaft and prolonged in both directions when the tunnel is being opened out. When the tunnels are of great length, such as those of the Alps, and can only be driven from the ends, the setting out is much more difficult. In this case the centre-line is determined by a triangulation survey, and ranged out from marked bases.

Small section tunnels are usually driven from one end to the other at their full dimensions. Large section tunnels are often driven in two stages: a pilot heading is excavated in advance which is afterwards enlarged to the full section of the main tunnel.

The normal procedure in T. in rock is as follows. Power drills are used to bore successive rounds of holes in the face. Each round is fired and the broken rock removed by hand shovels or mechanical loaders. The section is trimmed to its proper size by further blasting or by pneumatic picks, and timber or steel supports erected. Sometimes side and top lagging boards are required. In loose ground, the top laggings are driven in advance of the last supporting set (fore-poling) before the debris is removed. In sand or gravel, the problem is one of support rather than excavation, and fore-poling is necessary. The poling pieces are driven along the sides and top of the tunnel to protect the men from sudden falls or 'runs' of ground.

T. in heavily watered rocks or clay is sometimes done with the Greathead shield. This consists of a ring of steel which is forced forward by hydraulic rams, the piston heads bearing against the cast-iron lining previously set behind. Gravel and sand are usually drained before excavation. The *cementation* process has been employed successfully for dealing with water from rock fissures. The process consists in injecting liquid cement, at high pressure, through advance boreholes into the water-bearing fissures. The holes radiate outwards so as to intersect fissures on the outside of the tunnel area. After the cement has set and the water been sealed off, the tunnel is excavated and lined in the ordinary way. A second length is then cemented, excavated, lined, and so on until the water-bearing deposit has been passed.

In hard rock, blasting is necessary to break down the material. The blasting holes are usually from 6 ft. to 8 ft. long, but in some recent tunnels, 14 ft. and 15 ft. lengths have been adopted. The explosive often used is 60 per cent low freezing gelatine and sometimes stronger up to 80 per cent. Liquid air or liquid oxygen has been used as an explosive and has the advantage of leaving no blasting fumes. The recently introduced *delay action firing* for T. work, possesses many advantages over ordinary electric firing. The various shots in the tunnel face, constituting the complete round, explode either instantaneously or with a

time lag of 2, 3 or 4 secs. according to their position in the rock face. Delay action firing produces a large heap of well-broken rock which can be efficiently dealt with by power loaders. Ventilation is provided by means of a 15, 18, or 20-in. forcing fan delivering through air tubes to the tunnel face. The vol. of ventilation required depends upon the length, and size of tunnel and the presence of harmful gases or fumes. The problem of dust suppression is also given close attention on account of the danger of lung ailments, such as silicosis. Wet boring is done in practically all dry tunnels and the broken rock is copiously sprayed during loading.

Rings of reinforced concrete are gradually superseding cast-iron rings as tunnel supports. The concrete segments are bolted together as with cast-iron segments, but the former possess the advantage of being lighter.

In rock T., the average advance ranges from 4 ft. to 8 ft. per cut or blasting round and from 25 ft. to 100 ft. drive per working face per week, though these rates have in cases been much exceeded. The Florence Lake tunnel (15 ft. diameter), California, constructed in 1920, is 13 m. long; there were six working faces, the blasting holes were 18 ft. long; the average travel at each face was 125 ft. a week, so the total travel was 750 ft. a week or nearly 7 m. a year. Among recent Brit. tunnels, that of the Lochaber power scheme, completed in 1930, was 15 m. in length. It was excavated through igneous rock from 22 working faces and the maximum weekly advance at any face was 91 ft. The Mersey tunnel is one of the largest underwater roads for traffic in the world. It was commenced in Dec. 1925 and completed in 1934.

T. costs vary considerably, being governed by (1) cross-sectional area, (2) nature of ground, (3) skill of workmen, and (4) object and location of tunnel. One example: a tunnel 15 ft. wide and 12 ft. high supported by steel arches with steel and wooden struts, excavated in shale and sandstone costs an average of £25 per yd. including labour, materials, power, and incidental charges.

*The Channel Tunnel Scheme*, see CHANNEL TUNNEL.

See R. W. Richardson and R. S. Mayo, *Practical Tunnel Driving*, 1901; W. T. Halerow, *A Century of Tunnelling* (Thomas Hawksley Lecture), Inst. Mech. Engineers, 1942.

**Tunny** (*Thunnus thynnus*), large teleostean fish of the family Scombridae, allied to the mackerel. It is abundant in the Mediterranean, where its fishery has been an industry since ancient times, and is also found in the Indian, Pacific, and Atlantic oceans. It attains a length of 10 ft. and a weight of 1000 lb., and T.-fishing is a popular, but expensive, sport. It is used for food, Turkey having estab. a tinned T. industry.

**Tupi-Guarani**, two important tribes of S. Amer. aborigines, extending from the Amazon to the Lower Paraguay and the Peruvian Andes. At one time there were

numerous Jesuit missions, especially among the Guarani. A corruption of the Tupi language is spoken as the trade medium in the Amazon region. The Tupian tribes surpassed the other Brazilian aborigines in culture and civilisation. The Indians of Paraguay belong to the linguistic family of the T.-G., which is believed to have originated in the basin of the Paraguay and to have spread from the centre over much of S. America E. of the Andes. The Guarani are said to have estab. themselves in the Quechua country of E. Bolivia even before the arrival of the Spaniards. They make up most of the coastal people of Brazil to-day; and even well in the interior of the Amazon country tribes speaking this same language are to be found. The Guarani language is still the popular language of Paraguay, and many of the place-names of this part of S. America, including S. Brazil, are Tupi or Guarani words. See P. E. James, *Latin America*, 1941.

**Tupper, Martin Farquhar** (1810-89), Eng. author, b. in London. He pub. much poetry, including *Proverbial Philosophy* (1839-76), which was immensely successful at the time, but is turgid and commonplace. His autobiography appeared in 1886. Other works are *A Dirge for Wellington* (1852); *A Missionary Ballad* (1855); *Washington: a Drama in Five Acts* (1876). See D. Hudson, *Martin Tupper: His Rise and Fall*, 1948.

**Turanian, Tūrān**, Iranian term, was the name given by the Persians to the region situated to the N. of Amu-Darya (Oxus), roughly corresponding with modern Turkestan, which means 'the country of the Turks.' Medieval Arab geographers from the eleventh century onwards used the name Tūrān to indicate the region of contemporary Turkestan and its inhab.; in much later centuries the same term was employed by Europeans not only for Turkestan, but also for all Central Asia. In the nineteenth century, the term 'Turanian' as an ethnical and philological term, was applied to the Turks and Mongolians, and their languages, as well as to Scythians, Huns, Avars, Finns, Estonians, Hungarians, anct. Bulgarians, and others. Thus, roughly speaking, the term 'Turanian Languages' became synonymous with the Ural-Altaic (see URAL-ALTAIC LINGUISTIC FAMILY), consisting of the Finno-Ugrian and the Altaic linguistic sub-families (see LINGUISTIC FAMILIES). The term 'Turanian' is now obsolete.

**Turban**, head-dress of males of Muslim races, of very anct. orig., consisting of long pieces of fine linen, muslin, taffeta or silk, coiled and twisted round the head, a fez or turban forming the foundation. They are worn by all classes and vary in size and material according to the occupation, rank or country of the wearer.

**Turbary**, in law, *common of Turbary* is the right which a tenant enjoys of digging turf from the waste lands of a manor (see COMMON, RIGHT OF).

**Turbellaria**, see PLATYHELMINTHES.

**Turbine, Gas**, see JET PROPULSION, and under AKRO-ENGINES.

**Turbines, Hydraulic**, see HYDRO-ELECTRIC POWER.

**Turbines, Steam.** This turbine differs fundamentally from the reciprocating engine both in thermodynamical and mechanical action. In the reciprocating engine it is the pressure of the steam that constitutes the main driving force on the piston in the cylinders, and the steam leaves the cylinder at atmospheric or condenser pressure. The fact that in the expansive engine the steam is allowed to expand towards the end of the stroke does not invalidate the statement. In the turbine the steam expands in the nozzle before reaching the moving part, the blades, and part of the total heat content, or enthalpy, is converted into kinetic energy, i.e. the steam acquires velocity and streams at high speed into the blades where it is deflected by the shape of the blade, thus suffering a change in momentum, equivalent to an impulse imparted to the blade, which is the driving force. Sometimes a further expansion takes place in the blade (see below *Impulse-Reaction Turbines*). In the reciprocating engine, again, the pressure acting alternately on one side or the other of the piston generates a linear to-and-fro motion which has to be transformed into rotation, for driving a machine, by connecting-rod and crank pin, and the pull or push of the connecting-rod does not produce a uniform torque (turning momentum) on the shaft; a flywheel is necessary for carrying the rotation over the dead points and for smoothing the motion. Moreover, complicated valve-gear is required for directing the flow of steam alternately to one end or other of the cylinder. In the turbine, steam is admitted at a uniform rate to the blades fixed on the rotor, and a very smooth rotatory motion is immediately produced. No flywheel is required, and the consequent reduction in weight of the complete engine is important in all applications; the absence of reciprocating motion is another factor making for lighter foundation work.

**THEORY.**—Let the total heat (enthalpy) of  $J$  lb. of steam entering the nozzle be  $I.B.R.U.$  or  $J$  lb. ft., where  $J$  is Joule's equivalent (778.3 in recent Steam Tables). If the steam expands, with loss of heat to a value  $I_2$  on leaving the nozzle, the heat converted into kinetic energy is  $J(I_1 - I_2)$  lb. ft. If the initial velocity of the steam is negligible in comparison with the final velocity  $v$ , which is usually the case, the kinetic energy generated is  $\frac{1}{2} J v^2 = J(I_1 - I_2)$  and the steam velocity is  $v = \sqrt{2gJ(I_1 - I_2)}$ . If the pressure and temperature of the steam is known, the velocity can be calculated from data given in steam tables or from the Mollier entropy-enthalpy diagram. In a simple impulse turbine the velocity works out at about 3500 ft./sec. Now the steam does not flow out of the nozzle tangentially to the rotor periphery, but at an angle to



the tangent, and the impulse due to deflection in the blade determines the blade speed (Fig. 1). The latter therefore depends on nozzle and blade design, and the most efficient blade speed is a certain fraction of the steam velocity, whose values varies for different types of tur-

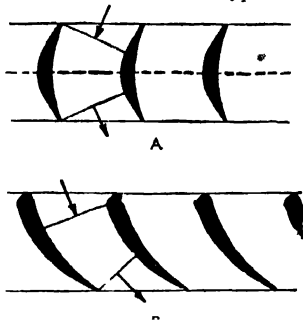


FIG. 1. TURBINE BLADING

A, impulse; B, impulse-reaction.

bine. When the initial and final pressure and the temperature of the steam are known the work done by the turbine per lb. of steam can be calculated, assuming adiabatic expansion, and, evaluating the external heat applied to generate the steam, the theoretical thermal efficiency can be found. For these calculations the Mollier diagram is convenient, though use of the steam-table numerical data gives a more accurate result.

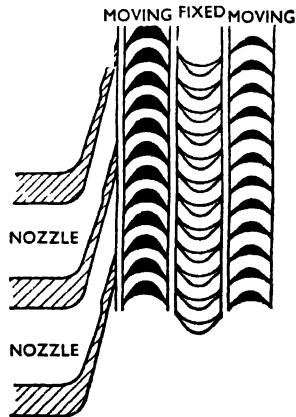


FIG. 2. IMPULSE TURBINES

**Impulse Turbines.**—In the simple impulse turbine there is one set of nozzles fixed on the inner surface of the cylinder or casing, and one rotor carrying a single row of blades as shown in the left half of the developed diagram (Fig. 2). The

nozzles usually have a round entrance and converge into a throat from which they widen out to the exit. The steam pressure falls in the nozzle to exhaust pressure, the steam enters the blade at high speed, is deflected, and thereby gives an impulse to the blade, and thereby gives an impulse to the blade, issuing with a 'leaving' velocity which is about  $\frac{1}{2}$  of the initial value. This represents a loss of energy of 11 per cent, the energy being proportional to (velocity)<sup>2</sup>. The loss can be partly recovered by passing the leaving steam through a set of re-directing fixed blades (Fig. 2) into a second row of blades on the rotor, which is then commonly known as a 2-row wheel. The 'leaving loss' may thus be reduced to 2 per cent. Sometimes a 3-row wheel is used with 2 sets of guide vanes, but the 2-row wheel is more efficient. The simple impulse turbine (de Laval) has a very high speed, up to 30,000 r.p.m. and is usually employed with reduction gearing. The most efficient blade velocity is about  $\frac{1}{2}$  the steam velocity, but as the expansion takes place in one set of nozzles, the steam velocity is very high, about 3500 ft./sec. and the max. practicable blade speed is about 1400 ft./sec. The 2-row velocity compounded (Curtis) turbine is also a high-speed engine but its efficiency is higher than that of the simple turbine. The most efficient blade speed is about  $\frac{1}{2}$  of the steam velocity. Velocity-compounding is often incorporated in other types of turbine. In the pressure-compounded impulse turbine the expansion of the steam is divided between a number of 'stages,' sets of nozzles, or diaphragms, interposed between blade-carrying rotors. In this way the steam velocity is considerably reduced. The pressures of steam on the two sides of a diaphragm being different, there is a certain leakage loss.

**Impulse-Reaction Turbines.**—The pure impulse-reaction turbine in which steam expands wholly in the moving element and issues at high speed from a nozzle, thereby imparting a recoil velocity to the nozzle, has never passed the experimental stage. The impulse-reaction turbine is often incorrectly called a reaction turbine. In the impulse-reaction (Parsons) turbine, the nozzles are replaced by fixed blades similar in shape to the moving blades and equal in number (Fig. 3). Steam is

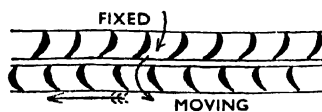


FIG. 3

FIG. 3. IMPULSE-REACTION TURBINE

admitted all round the circumference of the cylinder. The steam expands as usual in the fixed blades and enters the moving blades at high velocity, being deflected and giving an impulse to the blades; but a further expansion takes place in the moving blades and the velo-

city thus generated imparts a recoil or reaction to the blades, and the driving force is the vector sum or resultant of the impulse and reaction components. Steam velocity is moderate and blade velocity is nearly equal to steam velocity. Owing to the pressure differences throughout the successive rows of fixed and moving blades, there is some leakage loss, especially at the high-pressure stages, and blade edges should be sharp and well-fitting.

**Double-motion Turbines.**—In the Ljungström turbine the blades are arranged in concentric rows and fixed on separate disks. Instead of the first, third, etc., row being fixed, they are allowed to rotate in the opposite sense to even rows; the steam velocity may thus be doubled without any excessive speed being required by the blades to ensure high efficiency since the relative velocity of one set of blades with respect to the other set is twice its absolute velocity.

**Reheating.**—As steam expands through a turbine it first loses superheat, and then becomes wet. A small degree of wetness in the last few stages is unimportant, as the water has no time to separate out before it reaches the condenser. With a high degree of wetness, however, the unyielding drops of water strike the entering edges of the blades at a high relative velocity, and rapidly wear them away (erosion). Using steam at low or normal pressures, condensation can be reduced by adopting very high superheat temps.; but the materials employed in superheater and turbine construction, which rapidly lose strength above 500° C. (dull red heat), put a limit to this. With high pressure (500–1500 lb./sq. in.), even steam at red heat will not prevent condensation, and in sev. large modern turbines, therefore, steam is withdrawn after partial expansion and reheated in a re-superheater (combined with the boiler, or separately fired) before being returned to the turbine. This eliminates condensation, and so enables high-pressure steam to be used. For reheating, multi-cylinder turbines are usual, the steam being reheated between the h.p. and l.p.p. cylinders.

**Sources of Loss.**—(1) Friction. Steam passing through the blading and nozzles of a turbine at high speed is retarded by friction, and the full theoretical velocity is not obtained. To minimise this loss, modern turbines have a large number of stages, and small steam velocities in each stage. Blades are made of stainless steel and finished smooth; any pitting or corrosion in service greatly increases frictional losses. (2) Eddies are set up at the blades if the entering edges are eroded, or if the steam strikes them at a slightly wrong velocity or angle. This may occur if the boiler is not giving its full superheat temp. so that the calculated heat drop is not obtained; or, in the final stages, if the condenser circulating water is colder than usual (perhaps due to a frost). Eddies are so much wasted energy, as the steam velocity in them is dissipated in friction. Both friction and eddies make

the steam slightly hotter and drier at each stage than it theoretically should be (friction being a transformation of mechanical energy into heat), and condensation in the turbine is thereby delayed. (3) Leakage of steam past the blade tips occurs only in reaction turbines (*q.v.*), and depends on how small the clearances between fixed and moving blades can be made; it can never be entirely eliminated. (4) Leakage of steam through the packing occurs at the high-pressure gland, where the shaft passes through the casing, and also (in impulse turbines) at each nozzle-plate, where it meets the rotor. At the low-pressure gland, the turbine is at condenser pressure (sub-atmospheric), and consequently air leaks inwards. The air pump must therefore be made larger (*see Form of Condenser* below), and so absorbs more power. (5) Residual velocity. The steam leaving the last row of blades has a certain velocity, corresponding to a small amount of energy in the steam; this is not transferred to the rotor, and so is counted as a loss. (6) Supersaturation. Steam passes so rapidly through a turbine ( $\frac{1}{2}$  sec., or less) that water has no time to separate out at the condensation point, and the steam becomes super-saturated; in this state, it is cooled below its normal temp., and so has less energy to impart to the blades. The lost energy is evolved later as heat in the condenser, where it is not wanted. A compensating advantage is that erosion is somewhat reduced. (7) Radiation is reduced by careful lagging of all parts. In land turbine plant of 3000 h.p. and over, these losses reduce the actual turbine efficiency to 80–85 per cent of the theoretical. With marine turbines, which work under less favourable conditions, and smaller land turbines (down to 300 h.p.), where the losses are greater in proportion, the efficiency may fall to 60 per cent of the theoretical.

**THE EXHAUST FROM A TURBINE.—Advantages of Condensing.**—There is almost as much energy in a lb. of steam expanding from 5 to 4 lb./sq. in. pressure as in a lb. of steam expanding from 500 to 450 lb./sq. in. a pressure drop fifty times as great. For, although the pressure is very low (sub-atmospheric), the vol. of the steam is enormous, and work done is measured by pressure  $\times$  vol. These large stores of energy cannot be used in reciprocating engines, as cylinders cannot be made large enough to deal with it (*see STEAM ENGINES (THEORY)—Sources of Loss*); but the final or low-pressure rows of turbine blades can be made as large as required; and, if one row is insufficient, the steam flow can be divided a few stages before exhaust, and made to pass through two or more low-pressure sections in parallel (multiple exhaust). The steam turbine is most efficient at the low-pressure end; at high pressures, a piston and cylinder may even be preferable. But these low sub-atmospheric pressures cannot be attained without condensing the exhaust steam, and the lower the exhaust pressure, the larger the condenser. Thus the condenser—a minor

auxiliary in reciprocating steam engines—becomes a vital component in S.T. practice, ranking in importance with the boilers and the turbine itself, and often occupying a greater space than the turbine it serves.

**Forms of Condenser.**—These are usually of the surface type (see STEAM ENGINES (FORMS)—*Condensing Engines*), consisting of a large vessel of cast iron or mild steel plate, closed at the ends by two tube plates of brass (or occasionally steel), and traversed by a large number of brass tubes (see Fig. 4); cold water (circulating water)

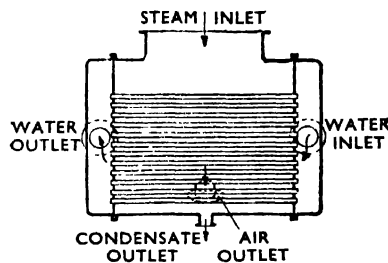


FIG. 4. CONDENSER

passes through the tubes, on the outside of which the exhaust steam is condensed. The condensed water (condensate) drips off the tubes, and is withdrawn from the bottom of the condenser by a small rotary or reciprocating pump, which delivers it to a hot well for feeding to the boilers. The air and other uncondensed vapours always present in steam, due to the leakage, etc., are extracted by a rotary air pump, or a steam or hydraulic ejector, through a separate outlet; the position of this varies in different types of condenser according to the direction in which the steam is required to flow. Steam always travels from the exhaust inlet, over the tubes to the air outlet, and this 'steam path' should be as short as possible, to reduce the pressure drop in the condenser. Without an air pump, the air would accumulate and mount up in pressure, and soon destroy the vacuum. The circulating water is forced through the condenser tubes by the circulating water pump; in land turbine installations this water is usually obtained from, and passed back into, an adjacent river; in the absence of such, the circulating water, after traversing the condenser, is cooled in a cooling tower and used again. In marine practice sea-water is used. Condensers for S. T. give back pressures varying from 2 to  $\frac{1}{2}$  lb./sq. in., corresponding to vacua of 26 to 29 in. (zero pressure = 30 in. vacuum).

**Back-Pressure Turbines, etc.**—Low-pressure steam for process work or heating, which must be uncontaminated by oil, can safely be taken from the exhaust or intermediate stages of a turbine. Turbines from which a part of the steam is withdrawn before exhaust, the rest being expanded to condenser

vacuum, are called Pass-Out or Extraction turbines; where all the steam is used, they are called Back-Pressure turbines. A small amount of steam is often passed out or 'bled' from ordinary turbines at different stages for heating the boiler feed water.

**GOVERNING** (see also STEAM ENGINES (MECHANISM OF THE STEAM ENGINE), *Governor*). Turbines driving electric alternators require very sensitive governors to keep the frequency of the electric supply constant; but they must also be able to shut off steam rapidly and completely in the event of a failure on the electrical side, otherwise the turbine will 'run away' when the load is suddenly removed by the circuit-breakers. In most turbines the main steam valve is operated by oil under pressure supplied by a pump on the end of the turbine shaft. The governor, of the horizontal spring-controlled type, controls the supply of oil, and thus varies the steam supply as required. In case of failure an emergency governor, set at a slightly higher speed than the main governor, trips an emergency steam valve, which is normally kept open, against a powerful spring by a trigger; once tripped, this cannot be re-set until the turbine has stopped. In reheating turbines, further rise of speed trips a valve between the re-superheater and the l.p. cylinder, since the steam in the former may be sufficient to raise the turbine speed to a dangerous value, even when the main steam valve is closed. A fourth line of defence is a vacuum-breaking valve on the condenser.

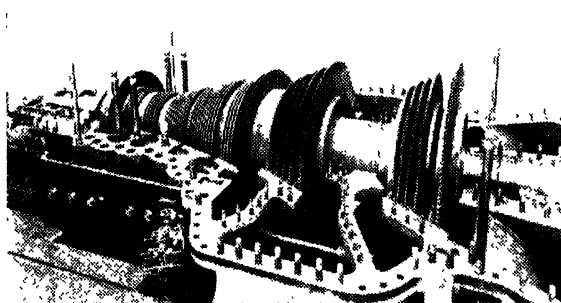
**EXAMPLES OF STEAM TURBINES.**—**Impulse Turbines.**—A large modern impulse turbine, built by the Metropolitan-Vickers Electrical Co., Ltd., of Manchester, for driving a 50,000 kilowatt alternator (= 67,000 h.p.), has two cylinders to minimise expansion stresses; these can be very large when one end of a cylinder is at the temp. of highly superheated steam (450° C. or over), and the other at the temp. of the condenser (down to 30° C.). The two rotors are mounted on separate bearings, and are connected to each other and to the alternator by flexible couplings. The rotors consist of forged-steel disks pressed on a steel shaft, with blades of nickel steel or stainless steel. The high-pressure (h.p.) cylinder is of cast steel to withstand high temps. and pressures, while the low-pressure (l.p.) cylinder is of the cheaper cast iron. The h.p. turbine has twenty-three pressure stages, and the l.p. eighteen, without velocity compounding; this is a large number (some impulse turbines have only four pressure stages), but the modern tendency is to reduce the steam velocity by increasing the number of stages (see *Sources of Loss*). Steam is admitted to the turbine at the first stage, with provision for overload by admission of additional steam at the sixth stage. The large increase in blade height in the final stages is noticeable, as also the divided exhaust in the last two stages to increase the exhaust blade area yet further (see *Forms of Condenser*). Steam is 'bled'

from four points in the l.p. cylinder for feed-water heating. A central-flow condenser is fitted, mounted on springs which take the weight but allow the condenser to expand with the turbine cylinder.

**Reaction Turbines.**—A large modern reaction turbine, built by Parsons & Co., Ltd., of Newcastle, for driving a 20,000 kilowatt alternator ( $\approx 27,000$  h.p.), has a single cylinder in two sections bolted together, the h.p. end of cast steel and the l.p. end of cast iron. There are thirty-five stages of which the last four are duplicated (duplex exhaust); for overload, additional steam is admitted at the eighth stage; and steam is 'bled' at two points for feed-water heating. The rotor is a large, one-piece steel forging, bored down the middle to reveal any interior flaws; the blades are of stainless steel, supported at their free circumference by a Monel-metal shroud ring. This is wider than the blades, and clears the

between the rotors are thirty-six concentric rings or rows of reaction blading, attached alternately to each rotor by special expansion rings; there are also four ordinary rows of blades, two on each rotor, mounted in the usual manner. This may be called a 20-stage machine, with duplex exhaust in the last two stages. Steam is admitted to the centre of the turbine between the rotors, and expands radially outwards; for overload, additional steam is admitted at the sixth stage.

**USES OF THE STEAM TURBINE.**—*Land.*—(Considered as a prime mover the steam turbine has the advantage over any reciprocating engine in that the motion of the moving parts is rotatory and the driving force is applied uniformly round the shaft. It is therefore possible with accurate design and good workmanship to ensure such perfect balance that the motion is barely perceptible. The torque exerted on the driven machine is thus



C. A. Parsons & Co., Ltd.

#### SINGLE CYLINDER TURBINE WITH DUPLEX EXHAUST

On the right is shown the low pressure turbine blades (integral type with erosion resisting shield) as used in the turbine illustrated

adjacent blade rows by only a few thousandths of an in.; steam leakage past the blade tips is thus minimised. An adjustable thrust bearing is provided at the h.p. end of the rotor to adjust these clearances. The shroud ring is finished with a sharp edge, which, in case of fouling, merely becomes blunted without damaging the rest of the turbine. The end thrust on the rotor is balanced by two dummy pistons at the h.p. end; in large multi-cylinder reaction turbines the steam from the h.p. cylinder is often led to the middle of the l.p. cylinder and expanded in both directions, exhausting at the two ends into two separate condensers; thus the exhaust area is doubled compared with a single-cylinder machine, and the l.p. rotor is balanced and needs no dummy pistons.

**Double Rotation Turbines.**—A turbine built by Ljungström drives two 25,000 kilowatt alternators ( $\approx 67,000$  h.p. in all) by two disk-shaped rotors, mounted face to face and rotating in opposite directions and connected in parallel. In the space

uniform, and if the load on the turbine is constant over a period of time, the speed is constant. The steam turbine is therefore without rival as prime mover for electric generators (see *ELECTRIC POWER GENERATION*), centrifugal pumps, blowers in iron and steel works, and certain textile machines. The high speed makes it possible to develop large powers in engines of small size requiring little space and comparatively light foundations. All large thermal power stations are now equipped with turbo-generators of sizes up to 105,000 kW. As the only parts needing lubrication are the shaft bearings there is not only considerable economy in lubricating oil, but the exhaust steam is uncontaminated by oil and needs no filtering before being passed to the condenser. Moreover, in factories where steam is used for heating or for various processes, the clean exhaust is immediately available. This is the case in laundries, paper mills, sugar refineries, cotton mills, and others. The steam turbine is thermodynamically efficient in

large sizes, above 5000 h.p. Between 10,000 and 100,000 h.p. its efficiency is unsurpassed by any other heat engine. Careful tests on various turbines show a thermal efficiency of 30-35 per cent and in some cases slightly higher, especially at high pressures with relief.

*Marine.*—As the ship's propeller becomes very inefficient at speeds above 2,000 r.p.m. direct turbine drive would require a large number of stages to reduce the steam velocity, and very large rotors, and though employed in earlier vessels has now given way to reduction-gear drive. Another solution is turbo-electric drive, which has many advantages. The high-speed steam turbine drives an electric generator supplying power to motors driving the shafts. The propelling motors can then be independently started, speed-regulated, and reversed by remote control from a central control board. Electric light is needed in any case, and electric power is convenient for working deck machinery, pumps, ventilators, and other auxiliaries, and for refrigerators, cooking, lifts, etc. As compared with the reciprocating engine the turbine has the advantage of light weight and small size. The latter factor is especially important as regards the space occupied vertically; with turbines it is possible to accommodate the engine rooms on one deck, whereas the reciprocating engine requires engine rooms, penetrating into two or more, thus interfering with passenger accommodation. Reciprocating engines would be impracticable for the modern large, high-speed liners.

The first turbine-driven ship was the *Turbinia* (1897), a small vessel built by Parsons to demonstrate his marine steam turbine to the Admiralty. It had three cylinders (h.p., i.p., and l.p.) driving three propeller shafts, and reached a speed of 34.5 knots (1 knot = 1 sea-m. per hour = 1.15 land-m. per hour). The first naval vessel fitted was the destroyer *Lyons* (1900), speed 36.5 knots (compared with 28 knots for previous destroyers); and since 1905, when the *Dreadnought* (23,000 h.p.) was so equipped, naval vessels of all classes have been fitted with steam turbines. The 42,000 ton battle cruiser *Hood* (1917) had 4 geared turbines developing 150,000 h.p. The first merchant ships with turbines were the *Victorian* and *Virginian* of the Allan Line, soon followed by the Cunard liner *Campania* (21,000 h.p., 1905); she proved so satisfactory that the two next Cunard mail steamers the *Lusitania* and *Mauretania* (67,000 h.p., 1907) were equipped in the same way, giving a speed of 26 knots. When the first of the 80,000 ton Cunarders of the *Queen* class was being built, a committee of experts was appointed to investigate various types of propelling machinery and advise the builders. John Brown & Co., on the choice. The shaft power required was estimated at 158,000 h.p. corresponding to a speed of 28.5 knots. The following types were discussed: Single-reduction geared steam turbines with Scotch boilers or with high-pressure water-tube boilers; turbo-

electric drive with Scotch boilers or h.p. water-tube boilers; Diesel-electric drive. The committee pronounced in favour of single-reduction geared turbines with h.p. water-tube boilers as representing the best combination of reliability, simplicity of construction and working, light weight, efficiency, absence of noise and vibrations, and cheapness of first cost and operation. There are twenty-four water-tube boilers for the propelling machinery and four Parsons turbine units each consisting of 1 h.p., 1 intermediate-pressure, 1 second i.p. and 1 l.p. turbine for ahead propulsion, each driving a separate pinion engaging with the main gear wheel. For astern propulsion a h.p. impulse stage is incorporated in the second intermediary. A separate turbo-generator supplies electric power for deck machinery, auxiliaries, lighting, and hotel service. Three cylindrical boilers supply steam for heating. The daily fuel consumption is 1000 tons. See W. J. Goudie, *Steam Turbines*, 1917; Proceedings of the Institute of Mechanical Engineers, 135, 1, 1937; A. Stodola, *Steam and Gas Turbines*, 1938; W. J. Kearton, *Steam Turbine Theory and Practice*, 1944, and R. H. Parsons, *The Steam Turbine*, 1916. **Turf Laws**, see under HORSE RACING.

**Turgeniev** (**Turgenev**, **Turgenev**, or **Turgenieff**), Ivan (1818-83), Russian novelist, b. at Orel, of an impoverished noble family, educated at Moscow, St. Petersburg, and Berlin. His mother made him an allowance, which she subsequently stopped on account of T.'s passion for the operatic singer Mme. Viardot. T.'s passion, though never reciprocated, endured, and this is apparent in his works, which are coloured by Mme. Viardot's personality. Incurring the displeasure of the Tsar for his polemical tone and his support of Gogol (*q.v.*), T. left Russia in 1855, the rest of his uneventful life being spent at Baden and Paris with the Viardot-Garcia family. In Paris, where he lived after 1870, he became exceedingly popular, and it was through the medium of Fr. trans. that his works first became world-famous. T. was indeed the first Russian author to acquire an international reputation, though he was by no means universally acclaimed among his fellow-craftsmen in Russia.

His chief novels, to give the names of Constance Garnett's fine Eng. trans. (14 vols. 1894-99) are: *Sportsman's Sketches*, an exposure of the utter wretchedness of Russian serfdom (1846); *A House of Gentlefolk* or *Nest of Nobles* (1859), *On the Eve* (1859); *Fathers and Children* (1862), his three finest works; *Smoke* (1867), and *Virgin Soul* (1877). Probably his greatest work was the *Nest of Nobles*, for this work displays to the full his consummate artistry in portrayal of character and in the description of the scenes in which they move. T.'s earliest work, *The Experiences of a Sportsman*, made a deep impression on the educated classes of Russia by the vigour of its attacks upon the vices of serfdom. It contains, however, a fund of humour and beauty which of themselves would have ensured its

vogue in Russia. But these memoirs rank among his masterpieces, both as works of art and as the expression of T.'s higher humanitarian ideals; in them he revealed the poetic beauty of the Russian landscape, and above all, the soul of the Russian serfs, the peasants with their reserved but deep customs, depicted, not artificially or sentimentally, but with all the peculiarities and limitations due to their uncultured state. *Fathers and Children* is a somewhat polemical story which describes the change that came over the educated classes of Russia about that time. T. also wrote a great number of very charming short stories, most of them having reference to Russian life; besides these, critical essays, plays, and poems. For his influence on the development of the novel in Europe generally, see under NOVEL. See M. Baring, *Landmarks in Russian Literature*, 1910; E. Hamont, *La Vie de Tourguénieff*, 1910; A. Yarmdinsky, *Turgenev*, 1926; E. Garnett, *Turgenev*, 1927; A. Maurois, *Turgenev*, 1931; Lord D. Cecil, *Poets and Story-tellers*, 1949.

**Turgot, Anne Robert Jacques Baron de l'Aulne** (1727-81). Fr. statesman and economist, b. in Paris. After holding various minor appointments he was, in 1761, appointed intendant of Limoges, a prov. whose prosperity was then at the lowest ebb. On the death of Louis XV., a wider field was opened for his enlarged and beneficent policy, and he was rapidly raised to the position of Comptroller-General. By a series of enactments, some of which were repealed immediately after his removal from office, he aimed at destroying the servitude of the peasant class and to remove the disabilities under which the townsmen suffered. But all those who had lived by these abuses, conspired against him, and Louis XVI. was too weak to resist. In 1776, he was dismissed.

He pub. sev. works on economics and literature including *Éloge de Gournay* (1759); *Lettres sur la liberté du commerce des grains* (1770); and *Réflexions sur la formation et la distribution des richesses*, written in 1766 and pub. in *Ephémérides du citoyen* (1769-70). His complete works were pub. by Dupont de Nemours (1809-11). See lives by Condorcet, 1786; A. Neymark, 1885; G. Shelle, 1909, and C. J. Gignoux, 1946.

**Turi Language**, see under NIGRO-AFRICAN LANGUAGES, *Sudan*.

**Turin** (It. *Torino*, anct. *Augusta Taurinorum*): 1. Prov. of Piedmont, N.W. Italy. The products include textiles, cattle, silk, copper, marble, and coal. Area 2116 sq. m. Pop. 1,413,500. 2. Cap. of the above and chief city of Piedmont, at the junction of the Dora Riparia with the Po, in a fertile plain at the foot of the Alps. It contains an anct. castle and sev. modern palaces, a fifteenth-century cathedral, and the mausoleum (Superga) of the House of Savoy near by. Its univ. (founded 1404) ranks next in Italy to those at Naples and Rome. There are fine museums, picture-galleries, and academies. The chief manufactures

are motor cars, steel and iron goods, silk and fabrics of all kinds. Important under Amadeus V. (1418) and the succeeding dukes of Savoy, it was held by the Fr. from 1506-62, and again in 1640, 1706, and 1798. After Marengo (1800) it was annexed to France, became cap. of Sardinia (1814-60), and of all Italy (1860-65).

T. suffered more severely in the Second World War than any other place in the region. Heavy damage of war plants was wrought by air raids in Nov.-Dec. 1942 and July 1943. Pop. 702,000.

**Thüringen**, see THURINGIA.

**Turkestan**, etymologically the land of the Turks; but this is no longer a true description, as in W. or Russia T. the Kirghiz and Turkomans make up the greater part of the pop., while the inhab. of E. or Chinese T. are mostly nomadic. Geographically, T. describes those regions of Central Asia which are shut in by Siberia to the N., Mongolia and the wide desert of Gobi to the E., Tibet, India, and Afghanistan to the S., and westward by the Caspian. The N. part of Afghanistan, between the Hindu Kush and the Russian frontier, is known as Afghan Turkestan.

*Russian Turkestan*.—Mainly low-lying, it rises in the E. to the Alai and the Trans-Alai, 'the ramparts of the Pamirs,' the Ala-tagh, and the Tianshan ranges; individual summits in T. rise as much as 23,000 ft. above sea level. The Amu-Darya (or Oxus) and the Syr-Darya (or Jaxartes) are the chief rvs. and are respectively 1500 and 1350 m. long. The country is interspersed with steppes, deserts, salt marshes, and great lakes like Lake Aral and Lake Balkash, which are fast shrinking in consequence of rapid desiccation. Silk, cotton, grapes, melons, and tobacco are the chief products from the many fertile oases. T. was conquered by Russia in 1866-73, in which latter year the emir of Bokhara and the khan of Khiva recognised Russian suzerainty. After the revolution, in 1920, the khan and the emir were deposed and Khiva and Bokhara set up People's Soviet Republics; the next year the governor-generalship of T. was constituted an Autonomous Socialist Soviet Republic. In 1924 it was decided to redistribute on a national basis the ter. of the three republics, and thus there came into being the Turkmen, Uzbek, and Tajik Soviet Socialist Republics, inhabited respectively mainly by Turkomans, Uzbeks, and Tajiks. Those parts of T. inhabited mainly by Kirghiz (Kazaks) were added to the already existing Kazak S.S.R.; some areas were, however, later separated to form the Kalpak A.S.S.R., S.E. of Lake Aral, and the Kirghiz S.S.R. See A. M. B. Meakin, *In Russian Turkestan*, 1915; S. Graham, *Through Russian Central Asia*, 1916; W. Barthold, *The History of Turkestan*, 1922; R. T. Etherton, *In the Heart of Asia*, 1925; M. A. Stein, *On Ancient Central Asian Tracks*, 1933; Ella K. Maillart, *Turkestan Solo*, 1934.

*Afghan Turkestan*.—Part of N.E. Afghanistan, comprising W. Turkestan

lying between the Hindu Kush and R. Oxus, adjacent to the U.S.S.R. A. T. is largely plain-land, inhabited by a pop. which includes Kirghiz, Turkomans, Uzbeks, and Iranian Tajiks. The Tajiks inhabit the tns.; they probably formed the original pop. of the area. The Kirghiz, who are nomadic, keep goats and Karakal sheep, whose lambs yield valuable skins. The Turkomans breed horses. The Uzbeks are also horsebreeders; they came originally from Uzbekistan, in the Soviet Union, and settled in N. Afghanistan. Some of them are farmers, cultivating cotton and rice. Wheat, lentils, and barley are cultivated, and cotton and rice are produced in increasing quantities. The mulberry is cultivated around the urban dists. for silk production, and much garden fruit is grown. The only industries are at Pul-i-khumri. A Ger. firm dammed the R. Kunduz before the Second World War, and an electric power station was built. There is a cotton factory employing over 2000 people, and the townsfolk have adopted many W. European customs. The R. Oxus separates A. T. from Soviet ter. and there is little communication between the people on either side of the frontier. At certain points Afghan wool is ferried across and handed to representatives of the Soviet Wool Trust, and Russian goods are exchanged.

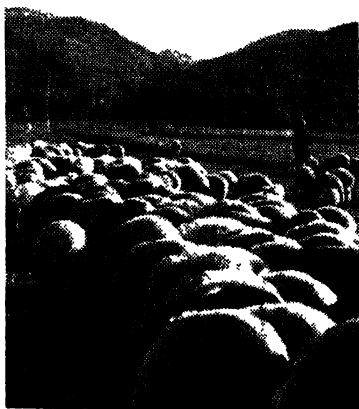
**Chinese Turkestan.**—Prov. of W. China, Eastern T., also called Upper Tartary, or Little Bokhara, is now usually known by the Chinese name of Sinkiang (*q.v.*).

**Turkey.** The republic of T. comprises parts of E. Thrace in Europe, including Istanbul (Constantinople) and Adrianople (some 9000 sq. m. in all), and in Asia the whole of Asia Minor from the Aegean Sea to the frontiers on the W. of Georgia and Persia and from the Black Sea in the N. to the frontiers of Syria and Iraq in the S.

**Geography.**—The total area of T., including T. in Europe, is 299,891 sq. m., including swamps, marshes, and lakes. Asiatic T. is practically restricted to Anatolia, the great plateau of Asia Minor (*q.v.*), and the dists. of Kars, Ardahan, and Batum (excluding Batum port). The chief rvs. are the Kizilirmak (Halyk), Euphrates (Firat), Sakaria, Murat, and Tigris (Dicle). The Bosphorus, which guards the approach to the Black Sea from the Sea of Marmora, and is at the same time the focus of all maritime trade between the Mediterranean and Russia, etc., as well as of the overland routes from Europe into Asia Minor, has fitly been likened to a tortuous riv. valley over whose wooded banks are scattered forts and towers, cities and vils., castles, and parks. The S. gate of the sea of Marmora is the Dardanelles, which gives an opening into the Aegean.

**Agriculture.**—The production of tobacco (98,710 metric tons in 1949) is the chief item in Turkish agriculture. Cotton is also cultivated: 32,063 metric tons were exported in 1949. Other products are cereals, figs, silk, olives and olive-oil, dried fruits, liquorice, almonds, nuts, mohair,

skins, hides, furs, wool, gums, and canary seed, linseed, serums. The chief tobacco dist. is Samsun, other dists. being Bafra, and Izmir (Smyrna). Bursa is the prin. centre for silk production. Olive-oil is chiefly confined to the Vilayet (il) of Aydin. The wheat yield in 1948 was over 4,800,000 metric tons, and that of barley 2,160,000 tons; agriculture is still primitive where railways are lacking, but the peasant is adapting himself to the more modern methods, especially in the Aydin, Adana, and Mersin Vilayets. In 1945 a Land Reform Act gave the landless peasants large tracts of land for subsistence. Livestock (1948) included over 19,000,000 sheep (wool output 21,000



*Turkish Embassy*

ANATOLIA: SHEEP ON A FARM NEAR ANKARA

tons), 11,000,000 goats and 3,000,000 Angora goats (mohair 4700 tons); oxen, 8,000,000; buffaloes, 700,000.

**Minerals** are still undeveloped, yet there is every reason to believe that iron, lead, and other metals exist in plenty. T. is one of the main chrome exporters of the world, and there are also exports of copper ore, manganesc., zinc, and borax, while the total production of coal is some 4,000,000 tons. There are silver and gold mines.

**Industry.**—Since the estab. of the Turkish Republic, in 1923, Turkish industry has made rapid advance. Under the Five Year Plan (1934), industrial machinery was imported, first from the U.S.S.R., later chiefly from W. Europe. Iron and steel, textile, mining, paper, glass, sugar, and cement works were estab. as staple industries. In 1936, a second Five Year Plan was prepared, dealing primarily with the mining industries and increase of electrification. A beginning has also been made to utilise the vast resources of hydro-electric power.

estimated at 2,200,000 kW. Hand-loom cotton weaving is still important, there are silk factories in Istanbul, and some traffic in shawls, leather, and the world-famous carpets. The chief exports are tobacco, cocoons, mohair, figs, raw silk, barley, and opium; whilst the imports are rice, linen, petroleum, woollen stuffs, cashmere, and machinery. In 1949 Turkish exports to the United Kingdom were valued at £185,604,000, being mainly figs, raisins, mohair, wool, tobacco, and nuts. Turkish imports from the U.K. in 1949 were valued at £139,997,000, these imports consisted chiefly of aeroplanes, iron and steel, and finished cotton, linen, and woollen goods. In 1949 T. exported £199,168,000 worth of goods to the U.S.A. (of which tobacco-leaf constituted the largest single commodity) and imported goods worth £161,313,000. T. has resumed trading with Germany, and in 1949 exported goods valued at £111,901,000, and imported £131,783,000. The merchant marine (1948) had a gross tonnage of 301,636, of which 212,110 were operated by the State.

**Internal Communications.**—At the end of 1947 T. possessed 25,543 m. of roads. Under a programme drawn up jointly by the Turkish Gov. and the Amer. Aid Mission in T. roads and highways of a total length of 11,316 m. were to be rebuilt or radically repaired by the most modern methods in three three-yearly periods beginning in 1949. T. had 1,460 m. of railways at the end of 1949, 2,203 m. of this having been built since 1923. All railways are State-owned. The prin. tns. and cities in T. are linked by the State Airways Administration. T. is connected to all the prin. caps. in the world by air. There is a large modern air-port at Istanbul.

**Defence.**—Military Service is compulsory for all men over the age of 20, and liability for service lasts for 26 years thereafter. Service is for 2 years, which may, in emergency, be increased to three years. The ann. contingent of men liable to service is about 175,000. The strength of the active army in 1938 was 20,000 officers and 175,000 men, but during the Second World War the strength rose to 11 army corps of 23 divs., an armoured brigade, fortress commands, and cavalry. More than 2,000,000 men can be mobilised. During the Second World War T. received equipment from the Allies, and since the end of the war the military forces have been extensively re-equipped with modern arms. The land forces contain 22 infantry, 6 armoured, and 3 cavalry units. The Navy includes the battle cruiser *Tamiz* (the old Ger. *Goeben*) (see GOEBEN AND BRESLAU), launched in 1911 (23,000 tons); 5 minelayers, 33 minesweepers, 12 destroyers, 10 submarines, and 100 miscellaneous vessels. The air force has been increased by Brit. and Amer. aid, and now possesses more than 1000 aircraft, 70 per cent. of the machines are of Amer. manuf. The air defence system is being equipped with types of modern radar gear.

**Population.**—A general census (the

first in Turkish hist.) was taken in 1927, and the total pop. was found to be 13,648,270. The census of 1945 showed a pop. of 18,790,171. T. is divided into 63 ils. The cap. is Ankara, pop. 226,700 (1945), but the largest city is Istanbul, pop. 845,300. Other important tns. are Izmir (Smyrna); Adana; Bursa; Eskisehir; Gaziantep; Konya; Kayseri; Erzurum; Diyarbakir; Siris; Samsun; Urfa; Maras; Zonguldak.

**Constitution and Government.**—On Oct. 29, 1923, T. was proclaimed a republic, and the constitution was promulgated on April 20, 1924. By the Constitution of Jan. 20, 1921, it was declared that all sovereignty belonged to the people, all power, executive and legislative, passed to the Grand National Assembly, a single chamber, as being the sole representative of the people. The members were originally elected for two years, and later by the Constitution for four years. Army officers may not sit in the Assembly. In 1934 women were given the right to vote and to be elected as deputies. In June 1946 the Assembly altered the Constitution so as to permit all Turkish men and women to vote in legislative elections at the age of 22, and to become deputies at the age of 30. The Electoral Law of 1946 substituted first degree for second degree elections, and provided for secret ballot, and public counting; this law was further revised in 1948 and took its final form in 1950 with the introduction of supervision of the secret ballot, and public counting by judicial election councils. The President, who may not vote, is chosen from among the deputies constituting the Assembly, and his term of office is identical with the life of the Assembly. The Assembly delegates its executive powers to the President and 'to a cabinet chosen by his appointee, the President of the Cabinet.' By the Constitution, local gov. was centralised, the largest administrative area being the il, and under the municipal law of 1930 both men and women have the right to vote and to be elected at municipal elections. In 1937 the Assembly agreed to the estab. of the principles of the Republican People's party, viz. nationalism, democracy, evolutionism, laicism, 'etatism' (State ownership or control of industries and communications) as part of the Constitution. This meant, in practice, a recognition of only one party in the State and estab. State Socialism. The formation of other parties was, however, authorised before the 1946 elections, the prin. being the Democratic party. Party gov. has begun to evolve, its peaceful estab. being, to a large extent, the work of President Inonu.

Inonu's republican party gov. ruled without effective opposition from 1923 until May 1950, when the electorate returned a gov. of the Democratic party under Celal Bayar. Bayar's party differs from the Republicans, not so much on account of its greater liberality, but in that it represents *laissez faire* capitalism as opposed to a régime which had retained traces of authoritarianism.



**Justice.**—The old religious courts and the former Courts of Appeal were abolished in 1924, and much of the Ottoman civil code discarded. In 1926 a new penal code was estab., adapted from the It. Code, and new civil and commercial codes, borrowed from Switzerland and Germany respectively. Judges are independent in trying and deciding all cases, and their judgment is final in all cases. For the training of jurists there are faculties of law at Ankara and Istanbul.

**Education.**—On March 3, 1924, the Moslem religious schools were abolished and replaced by State schools in which, or in community schools or private schools, primary education is compulsory. There are over 15,300 primary schools and over 320 secondary schools. There are univs. at Ankara and Istanbul (founded 1900), and a technical univ. at Istanbul: there are (1919) over 26,300 univ. students, men and women. In 1948 there was estab. a Brit. Institute of Archaeology at Ankara. By a law of Nov. 1, 1928, everyone between the ages of sixteen and forty was obliged to attend school to learn in place of the Arabic script, a Lat. alphabet incorporating various modifications of all the vowels except *e*, and omitting *q*, *w*, and *x*. There is a state broadcasting system, operating on three wave-lengths.

**History.**—It was by military conquests that the Ottomans secured a European foothold, and it was thus that the empire reached such splendid dimensions in the sixteenth century. In the seventh century the Turks first emerge from other tribes of the Turanian stock, and their story opens with the significant fact of their conversion to the Mohammedan faith. Little of consequence is told about them after this until Toghrul Beg, the leader of a branch of Tatar invaders, always known as the Seljuk Turks, captured Bagdad in 1058. This led directly to the foundation of imperial power by the Turks in Asia, a power which subsisted almost unimpured up to the First World War. Cairo and Jerusalem fell before the successors of Toghrul Beg, and soon the Turks were in possession of Asia Minor and the greater part of Syria. But the Seljuks could not maintain the integrity of their empire against the assaults of the Crusaders and their place was taken by the stronger and nearly related tribe of Ottomans. These latter, who like the Seljuks took their name from a warrior chief, Othman, overran all the Asiatic provs. that had once been within the confines of the Rom. empire, and made some headway in Europe. Adrianople made submission to Murat (Amurath) I. (1360-89), in 1361, soon the city of Constantinople and a few outlying and scattered dependencies were all that were left of the once mighty empire of Constantine.

When Amurath died he was succeeded by his son, Bajazet I. (1389-1403), who also proved a great conqueror. In 1396 he gained a signal victory at Nicopolis (in Bulgaria) over the allied armies of

Germany, Hungary, and France. The victory alarmed W. Europe, and Constantinople seemed doomed. Indeed Bajazet had actually begun the siege of that city when the victories of Tamerlane (Timour) forced him to cross the straits in haste to save his Asiatic dominions from this new aggressor. The issue was decided on the field of Angora (1402), where Bajazet suffered defeat. But the advent of Tamerlane only deferred and could not stave off the downfall of Byzantium. In 1421 the Ottomans made an unsuccessful assault, and finally Mohammed II. stormed the city in 1453.

Greece was annexed by the Ottomans between 1456 and 1460. Serbia had been subjugated in 1389 after the battle of Kosovo, Bulgaria in 1396, and Macedonia in 1430. Thus the Ottomans absorbed the E. empire, but it had not yet reached their farthest limits. Mohammed II. succeeded in penetrating into Italy, and for one year (1480) the city of Otranto (in Calabria) was under Ottoman sway. Selim the Indefatigable (1512-20) overran the is. of the Archipelago, took possession of the whole of Syria (1515), obliged the Abbasside Caliph of Cairo to surrender his jurisdiction, and finally annexed Egypt after defeating the Mamelukes (1516). Probably the empire attained its period of greatest splendour during the reign of Solymán the Magnificent (1520-66). This warrior-king captured Belgrade in 1521, and in the following year expelled the Knights of St. John from Rhodes. In 1526 he inflicted an overwhelming defeat on the Hungarians, and in 1529, after humiliating Vienna by a protracted blockade, he marched with a huge army against Germany, but retired on the advance of the Imperial Army. Charles's brilliant seizure of Tunis (1535) was a serious check to Ottoman influence in the S. After the death of Solymán in 1566 there were only two fresh acquisitions of importance, namely Cyprus, which was wrested from Venice in 1571, and Crete, which finally passed into Turkish hands in 1669.

From the last quarter of the sixteenth century dates the gradual but steady decline of the sultan's supremacy. Already, however, the commonwealth of Venice on the Adriatic and northward the kingdoms of Hungary and Poland had proved strong buffers between Christendom in the W. and the lands of Islam in the E. As early as 1456 John Hunyadi of Poland had repulsed the Turks from Belgrade, but the first serious disaster which overlooked them was the annihilation of their fleet in the gulf of Lepanto (1571) by the combined squadrons of Philip II. of Spain and the Venetians. This victory ended Ottoman encroachments in the Mediterranean. Most of the Turkish wars continued to be waged with Hungary and Venice and in 1683 the Turks were once more at the gates of Vienna. This time the cap. was rescued by the opportune arrival of John Sobieski, king of Poland, and the duke of Lorraine. The peace of Carlowitz, which concluded this war (1699), confirmed the

Venetian conquest of the Peloponnesus, securing Hungary for the Austrians. Herzegovina was ceded by Leopold to T. A second struggle between the House of Hapsburg and the Porte was terminated by the peace of Passarowitz (1718), when the former received Belgrade and part of Bosnia and Wallachia. T. had won back the Peloponnesus in 1716, and Belgrade was recovered in 1739.

By this time Russia was pressing hard upon the N.E. frontiers of the empire, and the long series of the Russo-Turkish wars began in 1730. By the peace of Kuchuk-Kainardji (1774) the sultan relinquished his suzerainty over the Tatar Khans of the Crimea, and Russia secured the approach to the Black Sea. The treaty of Jassy (1792), which closed a second war, was equally favourable to Catherine, for the N. boundary of the Ottoman empire was pushed back to the Dniester. In 1807, the year of the treaty of Bucharest, this boundary was put still farther S., as far as the Pruth. Twenty-one years later Nicholas I. of Russia declared a fourth war, concluded by the peace of Adrianople (1830), the chief provision of which was the recognition by the Porte of the complete independence of Greece. Nicholas had timed his invasion so as to profit from the sultan's embarrassment consequent on the Grecian insurrection.

The Crimean war of 1853-56 grew out of Tsar Nicholas's ambition to parcel out the Turkish empire, and so secure the major share, the Balkan peninsula, himself. England and France, however, supported T. At the Peace of Paris (1856) the integrity of the sultan's empire was maintained, and the Christian subjects were put under the aegis of the Great Powers instead of that of Russia.

The whole nineteenth century was marked by a series of revolts. In 1798 Napoleon had easily overcome the Mamelukes of Egypt, who were nominal vassals of T., but it was not till 1879, the year of the estab. of the dual control of France and England, that Turkish overlordship in Egypt finally came to an end. During the Gk. war of liberation, and afterwards, great barbarities were inflicted by the Turks on sev. groups of Christians, culminating in the atrocities perpetrated against the Armenians in 1895 and repeated in later years. In connection with this familiar chapter of Turkish hist., it is to be borne in mind that in 1877-78 Russian policy was to encourage the formation of a separate Armenian state under Russian supremacy. Russian intrigues to that end were directed from those Armenian dists. which had previously passed to Russian possession and which included Echmiadzin, seat of the Armenian catholikos. These intrigues combined with revolutionary nationalist conspiracies among Armenian exiles to exacerbate Turkish feeling which, it is alleged in Turkish circles, was still further outraged by Armenian treachery towards the families of Turkish pilgrims. It is said that when Turks went to Mecca they left their families in charge of their Christian

and Armenian neighbours and that the latter, incited by political intrigues fomented from outside, turned against their charges, but that W. writers have been discreetly silent on this chapter of Turkish-Armenian relations.

In 1877 Russia once more adopted the leadership of a Pan-Slavonic movement, and came forward as the defender of the Christians. Once more foreign interference alone stayed the Russian advance on the cap., and the short campaign was brought to an end by the famous Berlin treaty (1878), which was drawn up by the Great Powers acting in concert. By this agreement the independence of Bulgaria, Serbia, Rumania, and Montenegro was formally acknowledged. Bosnia and Herzegovina were occupied by Austria, and Cyprus handed over to Brit. control. E. Rumelia, whilst being retained by the sultan, was given an 'administrative autonomy' under a Christian pasha. Serbia, it should be noted, had been more or less free since 1807, and the Montenegrians had been virtually free from the Ottoman yoke since 1696. Moldavia, with Jassy, and Wallachia, with Bucharest as its cap., had coalesced into the single kingdom of Rumania in 1861. Cyprus demanded union with Greece as early as 1895; and in 1908 Crete, which was evacuated by Turkish troops in 1898, declared its affiliation with the same state.

The next stage was the movement of the Turks towards reform, and the adoption of W. gov. and practice (see ATATURK). As long ago as 1839 a body of progressive measures, entitled the 'Nati-i-Sherif,' was promulgated, and Christians were at last admitted to office in 1849. Riots in the cap. extorted from the sultan another and enlightened political constitution in 1876, and the Midhat Pasha (d. 1884) devoted a strenuous life to the furtherance of liberal ideas and progress. But the new constitution remained in abeyance until the Liberal party rose and demanded its restoration. The growing abuses of the gov. resulted in the formation of what is known as the 'Young Turk' party, which included in its ranks some of the most influential men in T. The movement was partly suppressed in 1901. Seven years later the 'Young Turks' again agitated with more effect, as the sultan opened a new Parliament, with Ahmed Riza, one of the leaders of the movement, as president. In 1909 the sultan was deposed, and his brother was called to the throne as Mohammed V. There had previously been trouble with France over the hinterland of Tripoli and with Bulgaria in regard to the 'liberation' of Macedonia. In 1908 Bosnia and Herzegovina were annexed by Austria, and in 1909 Bulgaria's claim to independence was accepted. In 1911 Italy forcibly seized Tripoli, and after a year's desultory fighting T. was obliged to sue for peace, as fresh trouble was brewing nearer home (see BALKAN WARS). The first Turkish Parliament was dissolved in 1912, and a fresh cabinet was formed the same year. The treaty of London,

signed on May 30, 1913, left T. with only a small strip of ter. in Europe, extending from Midia on the Black Sea to a point near Central Ibrige on the Aegean. T., however, took advantage of the Second Balkan War to take back Adrianople (July, 1913).

In 1914 Enver Bey, later Enver Pasha (q.v.), became minister of war, and he was under the influence of Germany, represented in T. by a military commission under Gen. Liman von Sanders (q.v.), who was appointed commander-in-chief of the Turkish army. On Sept. 8, T. declared the capitulations (q.v.) to be abolished, and following Turkish naval attacks in the Black Sea, Russia and then England and France declared war on T. Enver Pasha became a virtual dictator, but at the outset Turkish troops met with disaster in the Caucasus (q.v.). In the Allied attempts, however, to force the Dardanelles and take Constantinople the Turks held their own and saved the cap. (See DARDANELLES). The Turks were also fighting on the Mesopotamian front and were at first successful against the Brit. army beleaguered in Kut al Amara (q.v.). Ger. influence was able to bring about an entente between T. and Bulgaria, but in Aug. 21, 1915, Italy declared war on T. In 1916 the situation did not materially change, although T. was embarrassed by a revolt of the Arabs, who, led by Hussein (see HUSSEIN IBN 'ALI), declared the *Shereefate* of Mecca independent. In 1917 Sir Stanley Maude conducted brilliant operations on the Tigris, Bagdad being taken on March 11. In Feb. a change of cabinet brought in Talaat Bey as Grand Vizier, Enver Pasha remaining war minister. When the U.S.A. entered the War, relations with T. were severed, but there was no declaration of war. With the defeat of Bulgaria and in spite of T.'s advantageous peace with Russia at Brest-Litovsk (q.v.) in 1918 T. had no hope of victory. On July 3, 1918, Mohammed V. died and was succeeded by his brother, Prince Vahided-Din, who became Mohammed VI. In Oct., Enver resigned and Talaat was succeeded as Grand Vizier by Izzet Pasha. An armistice with the Allies was signed with T. on Oct. 30, 1918, at Mudros.

The 'Young Turk' party (the Committee of Union and Progress, as it was called) had abandoned Constantinople, where in 1919 a feeble Liberal Entente Gov. was in power with Damad Ferid Pasha as Grand Vizier. A movement, however, towards the regeneration of T. began in Anatolia, where Mustapha Kemal (see ATATÜRK) and his right-hand man, Rauf Bey, a former naval commander, convoked a Turkish Nationalist Congress at Erzerum on July 23, 1919. The Anatolian and Rumelian League for the Defence of National Rights, or simply the 'National Organisation,' resulted. On Sept. 4, 1919, a second congress was called at Sivas, and a party programme was drawn up. The Nationalist party under Kemal, being regarded as rebels, chose Ankara, an impregnable town, as its headquarters, while a Nationalistic army

was also formed out of local militias, with Kara Bekir Kâzım Pasha and Ali Fuad Pasha as commanders-in-chief of E. and W. Anatolia respectively. On Oct. 5, 1919, Damad Ferid fell from power in Constantinople. A new gov. was formed under Ali Rıza Bey and at the ensuing election the Nationalist party found itself legitimised by its strong representation. Moreover, in Jan. 1920 the Turkish National Assembly accepted the 'National



E.N.A.

MUSTAFA KEMAL (ATATÜRK)

pen-  
dence, promulgated from Ankara. Two months later, however, the Parliament was dispersed by Allied forces under General Milne, martial law was proclaimed, and Damad Ferid Pasha reinstated. The old Parliament, now outlawed, reassembled at Ankara, strongly 'Nationalist' in sympathy. On Jan. 20, 1921, the Law of Fundamental Organisation was drawn up at Ankara, placing the sovereign power in the hands of the Turkish people.

Meanwhile the Nationalist party was further strengthened by Turkish protests against the Gk. occupation of parts of Anatolia. The situation rapidly developed into war, of which the first phase in 1920 was favourable to the Gks., but in 1921 and 1922 the Gk. offensives were terminated by Turkish victories of which the last was complete (see GRAECO-TURKISH WAR). Gk. aspirations in Asia Minor were ended and all Thrace as far as the Maritza R. was restored to T.

A treaty of peace was signed at Lausanne on July 24, 1923, and ratified by Great Britain April 15, 1924 (see LAUSANNE, TREATY OF). The treaty settled T.'s international relations for some time following, territorial differences with Soviet Russia and the estab. of an overland route between Moscow and Ankara (made possible by the creation of the Soviet Republics of Armenia, Erivan, and Georgia) having been previously arranged by a treaty of March 16, 1921. By this treaty the dists. of Kars, Ardahan, and Batum (excepting Batum port itself) were assigned to T., and in the ensuing diplomatic struggles with Great Britain and the actual war with Greece T. could count on the tacit support of Russia.

In July 1922 Rauf Bey, who with Kemal had been mainly instrumental in causing the Nationalist Revolution, became Prime Minister. On Nov. 1, 1922, the sultanate was declared to be abolished. The National Assembly then elected the cousin of the deposed sultan, Abdul Mejid Efendi, to be plain caliph, but with no temporal powers. This 'spiritual' caliphate (see CALIPH, CALIPHAT) was finally abolished in 1924.

Meanwhile, on Oct. 2, 1923, the foreign occupation of Constantinople (now Istanbul) terminated, and on Oct. 29 T. was declared a republic. Mustapha Kemal, the Ghazi, or the Conqueror, was elected as president. The republic took the form of a powerful oligarchy led by a dictator and depending on a censorship of the Press. The Kurdish rebellion in 1925 aggravated the Mosul Question, which arose out of the conference to determine the boundary between T. and Iraq. Eventually on June 6, 1926, almost the whole vilayet of Mosul (*q.v.*) was given by treaty to Iraq. In March 1927 T. signed a commercial treaty with Russia, but later this was offset by frontier trouble with another neighbour, Persia. The general election of Oct. returned the Kemalists to power, and Mustapha Kemal was re-elected president by the new Assembly, which met in Nov. The Persian trouble was settled by a pact, June 15, 1928, and a Turco-Ir. Pact was ratified in Nov. On April 10, 1928, Mohammedanism ceased to be the State religion, although it has remained the religion of almost all Turks. According to the census in 1935 Muslims numbered 15,840,000. There were 125,000 belonging to the Gk. church, 11,000 Armenian Christians, and 80,000 Jews. Religious instruction in the schools was forbidden, but in 1948 it was made optional. In 1929 a commercial treaty was negotiated with Great Britain, and one was finally ratified on June 1, 1930. The financial crisis of that year brought back to domestic politics Fethi Bey, who formed a Free Republican party, recognised by Kemal as the official opposition. The work of 'westernising' T. being almost completed, the Ghazi relaxed his methods of dictatorial reform, but the position of the man who had created the new T. always remained unassailable.

Atatürk (Kemal) (*q.v.*) restricted the

new Turkish State to the area actually inhab. by Turks, exchanging, at the same time, the Gk. minority from Asia Minor with Turks domiciled in Greece and other Balkan countries. In 1934 the economic Five-Year Plan provided for a number of large State factories, the machinery being imported from Russia and W. Europe. In the new economic system, the State reserved the right to plan the general economic course and, while allowing private enterprise, owned the leading industries and supervised and co-ordinated the activities of private concerns (*etatism*). In 1931 T. joined in a regional pact with Greece, Yugoslavia, and Rumania for mutual guarantee of their respective frontiers, and in the same year by the Pact of Saadabad, T. strengthened her political co-operation with Iraq, Persia, and Afghanistan.

In the field of foreign policy, following the restoration of Turkish sovereignty over the Dardanelles in 1936 and the retrocession of Alexandretta (*q.v.*) or Iskanderun in 1938, Turkish relations with the W. democracies became closer: an Anglo-Fr. guarantee against aggression was given to T. in May 1939, and this was followed on Oct. 19 by an Anglo-Fr.-Turkish pact of assistance, effective for fifteen years. T.'s position, however, became difficult as the Second World War spread to the Balkans and from the time when Ger. victories in the near E. brought a semi-circle of Axis forces round her W. boundaries T. became the victim of great pressure from Berlin, and in June, 1941 the Turkish Gov. had little option but to sign a 'Treaty of Friendship' with Germany 'within the limits of the then existing commitments of both countries.' The Turks, however, throughout the negotiations kept the Brit. Gov. informed of progress. It transpired later that Italy urged Germany in 1941 to pass through T. and attack Brit. troops in the Middle E., but that the Gers. had preferred to postpone this operation till after the removal of the Russian danger which they hoped to effect in a few weeks. But the situation changed with the great victories at Stalingrad and El Alamein; and Turkish neutrality, which till then was favourable to the Allies, began to be profitable to the Axis. In Feb. 1945, however, by a unanimous vote the Turkish Parliament decided to declare war on Germany and Japan. That step was a consequence of the decision taken by the Allies at Yalta that nations at war with the Axis before March 1 would be qualified to enter into association with the original United Nations. In 1945 Russia denounced the treaty of friendship which she had made with T. in 1925, and in the following year made a demand unacceptable to the other parties thereto, for a revision of the 1936 Montreux convention by which T. had gained the right to remilitarise the Straits. This marked the end of a distinct phase in Turco-Russian relations: the post-Revolutionary friendship between the two countries, with the economic co-operation that had accompanied it, gave way once more to the

traditional grouping of T. in the W. European sphere of influence. America recognised the important position which T. holds as a barrier against the spread of Communism into the Middle E. and Asia, and made substantial loans in order that T. could utilise to the full her economic resources and strengthen her defences.

*Literature.*—Like early Lat. poetry, the literature of the Osmons is almost wholly one of imitation, and just as Terence and Plautus sought inspiration from the old Gk. writers of comedy, so the primitive Ottoman poets were much influenced by Persian verse. From Persian poets they borrowed their forms, their style, and their theme. Ahmed Pasha (*d.* 1496), a vizier of Mohammed II., freely plagiarised the popular 'ghazels' of the Persian Nevayi (*d.* 1500). Fuzuli of Bagdad (*d.* 1555), one of the first of Ottoman poets, is admired above all for the tender beauty of his *Divân* or collection of ghazels, and it was this vehicle (the ghazel) which the versatile Nâbi (*d.* 1712) chose when he wished to reproduce the didactic and philosophical strain of the Persian Sâib (*d.* 1677). The brilliant panegyrics of Nefî of Erzerum (*d.* 1634), are expressed in the form of the 'kasîda' or lyric of Arabia. Both the ghazel and the kasîda were adopted from Persian literature. In style again Ottoman writings reveal the merits and demerits of their Persian prototypes. They are mannered and insincere, and tainted with that artificiality which invariably infects a court literature.

The same thoughts are apparent in the prose hist. of Sa'd-ud-din (*d.* 1599), entitled the *Crown of Chronicles* (*Tâj-ul-Tenârikh*), where the excess of rhetoric pulls and where that favourite embellishment known as the 'sej,' which consists in rhyming the last words of successive clauses, produces a jingle which falls unpleasantly on W. ears. Finally, the imitation of Persian models is equally apparent in subject-matter. Ottoman poets, like their masters, never sang the song of battle, though they belonged to a race pre-eminently warlike, but devoted themselves rather to composing love-lyrics and odes to the joys of nature. In the last century a revolution was effected in literature as in the political world. W., and especially Fr., modes of thought filtered into the cap., and modern writers have gone back to a simplicity and naturalness of style more suited to their modern outlook.

*Art.*—Conquest influenced Turkish art between the eleventh and seventeenth centuries. The Turks proved extremely susceptible to artistic influence from the countries that they conquered, absorbing and adapting much that they found, so that their buildings became quite different from the simple structures of primitive Muslim culture. During the Seljuk era (c. 1073-1306) art remained fairly plain, although the frequently-used geometric decoration became more involved towards the end of the period. Under the Ottomans, with the growing wealth and power of T., all branches of art

became increasingly ornate. Examples of this are found in the cupolas and minarets of Edirne. Byzantine influence can be traced in the elaborate, rich detail. After the fall of Constantinople in 1453 Byzantine influence reached its zenith: in converting the church of St. Sophia into



*Turkish Embassy*

#### THE SULEIMAN MOSQUE, EDİRNE

a mosque, many tricks of Christian craftsmanship appear to have been absorbed, which were incorporated into the style of the Süleyman Mosque in Edirne (1570-74). The mosque remained the centre of Turkish life until after the estab. of the Republic in 1923. Most artistic developments are therefore found in religious buildings, but domestic architecture of the period shows the frequent use of elaborate trellis-work and carving. In the nineteenth and still more in the twentieth century, Turkish art copied W. European and N. Amer. styles. From this, however, a certain individuality of detail is now beginning to evolve. There are also many buildings within the area of modern T. belonging to the civilisations which the Turks conquered: the Byzantine remains at Iznik were largely destroyed during the Gk.-Turkish war in 1921, but Istanbul contains a number of Byzantine buildings, chief among which is the former church of St. Sophia.

Turkish music has evolved a distinct style of its own, setting it apart from the musical culture of other Arab states. A great contribution was made by the Derwish communities in the fifteenth century. They produced a large amount of inspired religious music such as *Hymns* (İlahi)

*Prayers of the Prophet* (Teveih), and *Songs of the Dervishes* (Ayn Charif). Modern developments are wholly influenced by W. European and N. Amer. styles.

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**Turkey** (*Meleagris*), name for two Amer. species, the largest of the game birds, once believed to have come from Turkey. *M. gallinacea*, the origin of the domesticated varieties, formerly occurred throughout the N. Amer. continent, and was abundant in the U.S.A., in parts of which it is still hunted with greyhounds. The wild birds are both larger and more ornate than domesticated Ts., which, however, have been improved by introductions of wild blood. The largest of the domesticated varieties is the Amer. mammoth bronze, the plumage of which is a beautiful dark bronze with a red metallic lustre. Among other varieties are the white, buff, slate, and black. *M. ocellata*, the other species, occurs in Honduras, and possesses plumage of great brilliancy with ocellated or eyed tail feathers.

**Turkey-buzzard**, see VULTURE.

**Turkey Oak**, *Quercus Cerris*, is common in the S.E. countries of Europe. It has deciduous, short-stalked leaves and bristly cups for the acorns.

**Turkey-red**, see DYES AND DYEING, *Anthracene-derived dyes*.

**Turki Runes**, see ORKHON INSCRIPTIONS.

**Turkistan**, see TURKESTAN.

**Turkmenia** or **Turkmen S.S.R.**, constituent republic of the U.S.S.R., the W. part of Russian Turkistan, bordering on Iran, Afghanistan, the Uzbek and Kazakh republics, and the Caspian Sea. It is mountainous in the S. and W. and a plain in the N. As a result of the hot climate, 80 per cent. is desert or semi-desert, but irrigation of the Kara-Kum (q.v.) is being effected from the Amu-Darya R. and subterranean supplies. There are oases, nourished by the waters of the mt. streams. Cotton (including a special long-fibred variety), wheat, and cattle are the main agric. products. Silk cultivation and carpet-weaving have been revived. Since 1925 chemical and other industries have been estab., and a new oil tn., Nebit-Dag; there are deposits of salt, oil, potassium, gypsum, magnesium, and coal. Research institutes number about fifty. The pop. consists of Turkomans (78 per cent.) with Russians and Uzbeks, etc., the first being Muslims. The cap. is Ashkhabad; other tns. include Merv, and Krasnovodsk, a seaport and the terminus of the Transcaspien railway. Administratively the republic is divided into the Ashkhabad, Mary, Tashauz, and Chardzhou Regions. Area 189,400 sq. m. Pop. 1,254,000. See also CENTRAL ASIA.

**Turkomans**, or **Turkmenians**, branch of the Turki race, inhabiting W. Turkistan (Turkmen S.S.R.) and N. Persia. They are chiefly nomad shepherds and are all Muslims, mainly of the Sunnite sect. They appear to be an offshoot of the Uzbeks, who reached the Caspian in the fourteenth century, and sev. dynasties in Asia Minor, Persia, Syria, and Egypt sprang from them. See V. Baker, *Clouds in the East*, 1876; A. Vámbéry, *Travels in Central Asia*, 1863, 1864.

**Turks.** The race of people who inhabit an area more extensive than the geographical limits of the country of Turkey. The region occupied by the Turkish people extends from the R. Lena in Siberia to the Danube in Europe and from the Crimea to Kerman and India, including the Arabo-Caspian basin of Turkistan (Land of the Turk). Ethnologically the Turkish race eludes classification, but it may be stated with reasonable authority that the Turkish peoples include the following groups. (1) The Osmanlis (q.v.), the people of the present Turkish Republic, who include descendants of Turkoman tribes driven into Asia Minor during the eleventh century, the Tatars of the Dobrudja, the Kizil-bashis of Tokat and Angora; and Turkoman tribes of Cilicia, principally nomads who move from the hills in winter to the plains. (2) Turkish nomads of Persia, called Ilyats, who are subdivided into the Kajars of Transcaucasia, the Aushars of Azerbaijan,

the Kara Koyun-lu of Khol, all of them Iranian-Turks. (3) The T. of Siberia and Russia, called Tatars or Tartars. (4) The Uzbeks of Central Asia, an industrious and highly civilised race, maintaining themselves by agric. pursuits. Together with the Osmanlis they possess a separate written language and literature. (5) The Turkomans of the E. Caucasian steppes, who include Inarails, Yomuts, Goklen, Tekkes, Sakars, Sariks, Salors, Ersaris, and Ali-ells. They are principally nomads, and up to 1880 terrorised the surrounding country by their predatory habits.

The Kirghiz (*q.v.*) have preserved, more than any other tribe of Turkish origin, the anct. racial characteristics of the T., in whom there is a marked affinity with Mongolian types just as there is in language and literature. Indeed, what is known to-day of the Turki race is due more to linguistic evidence than to that of ethnology, which remains obscure.

**Turksib (Turkistan-Siberian) Railway**, railway of Siberia connecting Novosibirsk with Tashkent and Alma Ata, and traversing about 1000 m. of arid country along the former camel route. Oil-driven locomotives can accomplish the journey in four days. The construction of this line has made possible a large-scale industrial exploitation of Kazakhstan.

**Turk's Islands**, *see* CATCOS, CAYOS, OR THE KEYS.

**Turku**, *see* ÅBO.

**Turku-Pori** (formerly Åbo-Björneborg), prov. of Finland, on the gulfs of Finland and Bothnia, with numerous lakes. Mining, fishing, and cattle-rearing are carried on; there are manufs. of paper, leather, tobacco, wood, and metal products, and distilling and brewing. The cap. is Åbo; Raumo and Björneborg are prin. tns. Area (land) 8500 sq. m. Pop. 536,100.

**Turmain, Johann**, *see* AVENTINUS.

**Turmeric** (*Curcuma longa*), plant with long leaves and a spike of pale cream flowers, a native of Ceylon, and extensively cultivated in India for its rhizomes, which when dried and ground yield a yellow dye. It is also used as an ingredient in curries, and has various uses in Hindu medicine. T. paper is an unsized paper dipped in an alcoholic solution of T., and is used as a test for alkalis, with which it gives a brown colour turning violet on drying.

**Turn**, *see* under ORNAMENTS, MUSICAL.

**Turnbull's Blue**, blue pigment which is precipitated by the action of potassium ferricyanide on a ferrous salt. Its composition is identical with that of insoluble Prussian blue, viz. ferric ferrocyanide,  $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3 \cdot 10\text{H}_2\text{O}$ , which is formed on the addition of a ferric salt to a ferrocyanide.

**Turner, Joseph Mallord William** (1775–1851), Eng. landscape painter. The son of a barber, he was b. in London. In 1789 he entered the Royal Academy School where he became intimate with Girtin. Though his education was much neglected he had the good fortune to be

acquainted with Sir Joshua Reynolds and studied in his home. In 1798 T. exhibited sev. pictures at the Royal Academy, and four years later he was made an academicalian. In 1807 he began the pub. of his *Liber Studiorum*, consisting of a series of Eng. landscapes, many of them engraved by the master himself. In 1828 he travelled in France and Italy, and in 1831 he visited Scotland, having been asked to illustrate a new ed. of Sir Walter Scott's poems. The following year he lived at Venice, and in 1836 he went a second time to France; but the closing years of his life were spent mainly in London, and he d. there. He was buried in the crypt of St. Paul's Cathedral, and, in accordance with his will, the National Gallery acquired a large array of his oil-paintings and over a thousand of his sketches. In the Glasgow Art Galleries are also a number of his works and there is a fine collection of his water-colours in the National Gallery of Scotland. T.'s earlier paintings are sober in colouring, blue, greys, and browns predominating; the pictures of his middle and late period are remarkable for their splendour of colouring and brilliance of light effects, as exemplified in 'The Fighting Temeraire' and 'The Sun of Venice Going to Sea.' T. possessed pre-eminently the gift of capturing and rendering transitory effects of light, and his triumph herein proved a vast inspiration to the Barbizon school and afterwards to the impressionists. The most important study of his art is that embodied in Ruskin's *Modern Painters*. *See also* W. G. Rawlinson, *Turner's Liber Studiorum*, 1906, and *The Engraved Work of Turner*, 1908–13; W. Bayes, *Turner: A Speculative Portrait*, 1931; B. Falk, *Turner, the Painter*, 1938. *See* lives by G. W. Thornburg, 1877, Sir W. Armstrong, 1902, and A. J. Finberg, 1939.

**Turner, Walter James (Redfern)**, (1889–1946), Eng. poet, novelist, and music critic. He was educated at Scotch College, Melbourne, and studied music under his father, then organist of St. Paul's Pro-Cathedral there. T. came to England as a boy and later travelled much in Europe, studying at Vienna, Dresden, and Leipzig. During the First World War he served in the Brit. army. He was music critic for *The New Statesman* from 1916 to 1940, and literary critic for the *Daily Herald* from 1920 to 1923. He was literary editor of *The Spectator* from 1940 to 1946. His poetry is distinguished by its delicate fantastic quality, while his biographies of musicians have become standard works.

**Turner Valley**, dist. of Alberta, Canada, 35 m. S.W. of Calgary. There is a vast subterranean oil pool which has been developed since 1936 and now produces 97 per cent of the Canadian output of petroleum.

**Turnhout**, tn. of Belgium, 25 m. E.N.E. of Antwerp. It is the economic cap. of the Campine Region. T. is famous for its paper industry, and its coloured papers and playing-cards are largely exported. There are also printing-works, iron-foundries, mills, brick-kilns, and

manufs. of lace, pottery, chocolate, and gingerbread. Pop. 32,100.

**Turnip**, or *Brassica rapa*, biennial cruciferous plant grown for its thick fleshy root both as a garden and a farm crop. Ts. are classified according to their shapes, Long, Tankard or Spindle, Round or Globe, and Flat. Another classification is according to the colour of the flesh. White-fleshed varieties are of rapid growth and produce much bulk in a short time, but their feeding value is low and they are liable to be injured by frost. The yellow-fleshed varieties are of slower growth, but are of superior feeding value and keep better during winter. They are probably hybrids between the T. and the Svede (*Brassica rutabaga*), which is distinguished by its neck or collar.

**Turnpike Roads**, see TOLLS.

**Turnsole**, see HELIOTROPE.

**Turntable Ladders**, see FIRE BRIGADES AND FIRE FIGHTING, Fire 'Escapes' (Ladders).

**Turnu-Severin**, city in the co. of Mehedinți, Rumania, on the l. b. of the Danube. The old tn. was destroyed in the fifteenth century, and the present one was founded 1835-41. It trades in live stock, cereals, and petroleum, and has shipyards and repair shops. It was captured by the Austrians in 1916, and by the Russians in 1944. Pop. 30,400.

**Turpentine**, is obtained by cutting the stems of pine trees of *Conifera* and collecting the sap which flows out. It consists of a solution of resins in a liquid called 'oil of T.' Distillation in steam causes the essential oil to pass over, a residue of 'colophony' (violin resin) being left behind. Oil of T. is a colourless liquid (sp. gr. .86, boiling point 158-160° C.) which is not constant in composition or physical properties, but varies according to the species of pine from which it is obtained. It is insoluble in water, but is an excellent solvent for phosphorus, sulphur, iodine, and resins, and is used in the preparation of paints and varnishes. The oil is used in medicine externally as a counter-irritant. Chemically, oil of T. is a mixture of various terpenes in somewhat variable proportion. The main constituent is pinene,  $C_{10}H_{16}$ .

**Turpentine Tree**, see TREEBENT.

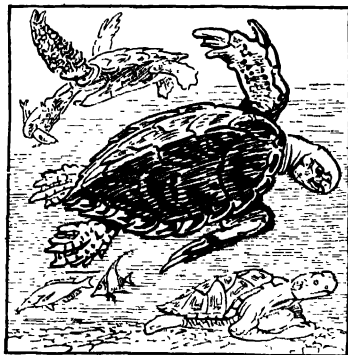
**Turpin, Richard (Dick)** (birth variously stated as 1705, 1706 and 1711; hanged 1739), Eng. highway robber whose fictitious exploits on his mare 'Black Bess' have secured for him an almost legendary renown (see Harrison Ainsworth's *Bookwood*). T. was the son of an Essex inn-keeper, and began his predatory career by cattle-stealing when apprenticed to a butcher (see H. J. Wheatley, *London, Past and Present*, 1891). He was ultimately convicted at York of horse-stealing and hanged.

**Turquoise**, or *Callait* ( $Al_2O_3 \cdot P_2O_5 + 5H_2O$ ), blue or bluish-green mineral which is in great favour as a gem. It is reniform or stalactitic, never crystallised, has a waxy lustre, and is feebly translucent or opaque. (Hardness 6, sp. gr. 2.7). The blue or green colour is due to the presence of copper phosphate. On placing in hy-

drochloric acid the colour disappears. The best specimens for gems are obtained in Persia, others in India, Tibet, Arabia, and Saxony.

**Turriff**, burgh of Aberdeenshire. Scotland. Originally known by the Celtic name of Turbrud, the tn. had its origin in the sixth century. It is an agric. mkt. tn. and egg-packing centre, 38 m. N.W. of Aberdeen, and its chief industries are agric. engineering and implement-making. Pop. 2800.

**Turtle**, aquatic reptile of the tortoise family (*Thelonida* or *Chelonida*). Ts. differ from land tortoises in having the feet modified into paddles. They resort to the sandy shores to lay their eggs. The green T. (*Chelone midas*) is used for turtle soup. The hawksbill turtle (*Chelone unbricata*) yields tortoise shell. See also CHELONIA; TERRAPIN; TORTOISE.



HAWSBILL TURTLE

**Turtle Dove**, or *Streptopelia turtur* (or *Turtur communis*), summer visitor to Britain, which it leaves about Michaelmas to winter in Africa. It is from 12-13 in. long, with a long, much-rounded tail. The plumage is greyish brown with yellow on the sides of the head and pink on the neck and breast. The back of the neck and crown are greyish blue, and the legs and toes are red. Two pure white eggs are laid in a rough structure of twigs placed in a tree near the ground. The male assists the female in incubation, and their devotion is proverbial. Another species is the collared T. (*T. risorius*), which is often kept in captivity. This latter species is about 10 in. long; has a short tail; general colour grey, tinged with red, upper parts greenish-brown, with black collar on back of neck.

**Turton**, tn. of Lancashire, England, 4 m. from Bolton. It is largely agric. with a few cotton bleaching, finishing, and printing mills in the dist. T. Tower, a sixteenth-century mansion, is now used as a civic centre. Pop. 11,000.

**Tuscan** (architecture), style which had its origin in N. Italy, on the revival of the arts in the free cities. Beyond these it has not extended, excepting in a few



examples which were introduced by Inigo Jones in the first church of St. Paul, Covent Garden, and by Wren in porticoes at St. Paul's Cathedral. It is a simpler variety of the Doric, with unfluted columns and without triglyphs.

**Tuscany** (It. *Toscana*, anct. *Etruria*), region comprising the S.W. of the N. half of Italy, bounded N. by Emilia, E. by Umbria and the Marches, S. by Latium, and W. by the Mediterranean and Liguria. Most of the country is hilly, containing that part of the Apennines known as the Apuan Alps and being bounded on N. and E. by the Etruscan Apennines. The marshy Maremma (850 sq. m.) in the S. was drained by Leopold II. early in the nineteenth century, and now affords pasture to horses and cattle. The Arno is the chief riv., united to the Tiber (E.) by the Ciano Canal. There are nine provs. Florence, Leghorn, Pisa, Siena, Lucca, and Arezzo are the chief industrial centres. Chianti and Montepulciano wines, oil, grain, flowers, and silk are produced. There is much mineral wealth, and hot springs abound.

The Tuscan language became the literary language of Italy. Under the Medici Florence was of supreme importance in T. A grand-duchy of T. was formed (1567); from 1737 it was under the House of Hapsburg-Lorraine. T. was invaded during the Fr. Revolution, duke Ferdinand III. being forced to flee; in 1801, by the Peace of Lunéville, it was assigned to Spain, and in 1807 ceded to Napoleon. Ferdinand returned in 1814 and, under his son, Leopold II., a constitution was granted (1848), but a rebellion broke out and for the ensuing few years Leopold ruled with the help of Austrian troops. In 1859 Leopold was expelled by the Florentines and T. declared for annexation to Sardinia, being incorporated in the kingdom of Italy in 1860. T. suffered heavy damage during the Second World War. Area 8876 sq. m. Pop. 3,099,000. See Zola, *Storia Civile della Toscana*, 1850; J. A. Ross, *Old Florence and Modern Tuscany*, 1904; A. M. and J. W. Cruikshank, *The Smaller Tuscan Towns*, 1912; E. Hutton, *A Wayfarer in Unknown Tuscany*, 1925; and D. Patmore, *Italian Pageant*, 1950.

**Tuscaroras**, tribe of N. Amer. Indians, driven out of N. Carolina in 1715 by the settlers, and of Iroquoian stock. In the War of Amer. Independence they divided, some fighting for, others against, the Eng. The remnant of them, numbering about 700, is now divided between reservations in Canada and New York State.

**Tusculum**, anct. tn. of Latium, said to have been founded by Telegonus, son of Odysseus. The modern Frascati is close to the site. When Octavius Mamilius, Tarquin's son-in-law, was driven out of Rome, he took refuge in T., whence he led the Lat. allies of Lars Porsena against the Romans, but perished in the great battle of Lake Regillus (497 B.C.). From that time till the Lat. war of 340 B.C., it remained faithful to Rome. Cato the Censor was a native of T. Its proximity to Rome and the beauty of its situation,

made it a favourite resort of the Rom. nobles during the summer. Cicero had a villa at T., which he frequently mentions under the name of Tusculanum.

**Tuskegee**, tn. of Alabama, U.S.A., about 50 m. due E. of the cap. Montgomery. It is noted for the T. Institute, a Negro univ. and the next oldest to Hampton (Virginia). It was founded by Booker T. Washington and is notable for the scientific work done in its laboratories by Dr. George Washington Carver. Most of the students, who numbered nearly 2000 in 1948, are from the Lower S., and the student body is 99 per cent Negro; there are a few Amerindians; the faculty is exclusively Negro. Pop. 3900.

**Tussaud, Madame Marie** (1760-1850), foundress of the waxwork exhibition in London, b. at Bern, Switzerland. She studied art under her uncle in Paris, and was appointed drawing-mistress to the ill-fated family of Louis XVI. Coming to England in 1802, she settled in London, where her exhibition became, and still is, one of the most popular sights of the city. The building was destroyed by fire in 1925 and re-opened in 1928. During the Second World War it was damaged by a bomb in 1940. See L. Tussaud, *The Romance of Madame Tussaud's*, 1937.

**Tussock Grass**, or *Dactylis cespitosa*, tall-growing grass, native of the shores and sand dunes of the Falkland Isles. It has been introduced into Britain, and in a few places is cultivated as a fodder for cattle. The name is also given to the tufted hair grass (*Aira cespitosa*).

**Tussock Moths** (*Dasychira*), genus of moths, two species of which occur in Britain, the rare dark T. M. (*D. fasciata*) and the pale T. M. (*D. pudibunda*), a common moth of a greyish colour. Its caterpillar, which has a number of tufts or tussocks of hair, sometimes causes considerable damage to hops and forest trees.

**Tutankhamen**, Egyptian king of the XVIIIth dynasty, son-in-law of the famous Akhnaton, and conjectured to have been a son of Amenhotep III. A comparatively obscure Pharaoh, T. was one of Akhnaton's adherents in the great religious revolutions which Akhnaton tried to achieve in Egypt. On the death of Akhnaton, Smenkhara, husband of the eldest princess, reigned for a short time, and on his death or deposition, T. succeeded to the throne as Tutankhamen, with his seat of gov. at Akhetaten (Tel el-Amarna). Orthodoxy, however, proved too strong for him, and he had to revert to the worship of Amen and remove the Court to Thebes. He appears to have reigned for no more than nine years, and to have died a young man. But if obscure as a monarch his name has become invested with a rare glamour from the world-famous discoveries made in the Valley of Kings by Lord Carnarvon and Howard Carter. The discovery of T.'s funeral paraphernalia proved the most remarkable in the whole history of Egyptological research.

The find was made in Nov. 1922, after the two explorers had worked systematic

cally for some sixteen years, first at Thebes and later in the abandoned Valley of Kings, before their laborious efforts were rewarded by lighting upon the first intact royal tomb-chamber ever found in Egypt. The most celebrated of the articles found there was the Royal Throne or Chair of State, which is regarded as one of the wonders of the world. It is of wood covered with gold plating and adorned with carved lions' heads, and the seat is patterned with blue, white and gold mosaic squares, the whole effect being gorgeous to a degree. See J. Baikie, *A Century of Excavation in the Land of the Pharaohs*, 1929.

**Tutbury**, tn. of Staffordshire, England, on the Dove, 4 m. from Burton-on-Trent and 140 m. from London by rail. T. has a ruined castle, in which Mary Queen of Scots was imprisoned. There is a parish church built in 1083, which is notable for its Norman doorway. The tn. has an agric. trade; and old glass-cutting worked famed throughout England. Pop. 2000.

**Tuticorin**, second seaport of Madras, India, in the Thiruvelli dist., on the Gulf of Manaar. It is the S. terminus of the S. Indian railway. Its industries include cotton weaving, cotton ginning, and salt production, and there are industrial and training schools. Pop. 86,800.

**Tutor**, in Scots law, the guardian and legal representative of the person and the administrator of the estate of a pupil, i.e., a male child under fourteen and a female child under twelve. Ts. are either: (1) *nominat*, i.e., he who is named by the father or mother in a will or other document; (2) *of law*, i.e., he who succeeds by mere operation of law in the absence of nominat Ts. (seldom resorted to); or (3) *dativ*, i.e., he who applies where no T.-of-law demands the office.

**Tuva**, autonomous Region of the R.S.F.S.R., in S. Siberia, with Outer Mongolia to the S. The W. part is steppe land and the E. is wooded. Stock raising is the primary occupation of the Turki pop. There are deposits of gold, asbestos, iron, naphtha, and carbon. Until 1912 T. was part of Mongolia, from 1912 to 1914 was independent, from 1911 to 1919 under Russian supervision, and from 1919 to 1924 under Chinese. In 1924 it estab. a constitution on the Russian model and in 1944 was incorporated, as the Tamm-Tuva Republic, in the R.S.F.S.R., becoming a Region in 1945. The cap. is Kysylcheto (Krasny), formerly known as Khem-Belder. Area 64,000 sq. m. Pop. 76,000.

**Tuxtla Gutierrez**, cap. of Chiapas state, Mexico, 265 m. S.E. of Vera Cruz, and 50 m. S.W. of San Cristobal. There is mining and fruit-growing in the dist., which also produces sisal, coffee, cattle, and tobacco. Tanning and indigo industries are carried on. T. G. is on the Pan-Amer. Highway. Pop. 15,900.

**Tver**, see KALININ.

**Twaddell**, see under SPECIFIC GRAVITY.

**Twain, Mark**, see CLEMENS, SAMUEL LANGHORNE.

**Tweed**, woollen fabric, manufactured in Scotland and Ireland and extensively

worn. The Harris and Donegal tweeds are notable. The name seems to be a corruption of 'tweel,' or 'twill,' used for materials with parallel diagonal lines over the surface of the cloth.

**Tweed**, riv. in the S. of Scotland, draining most of the E. portion of the Scottish lowlands. It rises in the S.W. of Peeblesshire and flows in a N.E. direction, between Berwickshire on the N. and Northumberland on the S., entering the N. Sea. It has a total length of 97 m., and drains an area of 1870 sq. m. It is one of the best salmon streams in Scotland, but the fisheries are less important now than they were formerly. The traffic on its waters is chiefly confined to Berwick, and it is navigable only in its last 6 m. See Sir H. Maxwell, *The Story of the Tweed*, 1905.

**Tweeddale**, see PEEBLES.

**Tweedmouth**, part of bor. of Berwick-upon-Tweed, Northumberland, England. It has a dock, and its industries include timber saw-mills and joining works. Pop. (estimated) 4600.

**Tweedsmuir, Baron**, see BUCHAN, JOHN.

**Twelfth-Day**, the festival of the Epiphany, in commemoration of the visit of the three kings to the infant Jesus, kept on the twelfth day after Christmas, Jan. 6. Many ceremonies are connected with Twelfth Night, Jan. 5. See EPIPHANY.

**Twelve-Note Music**, new system of composition on which the later works by Schoenberg and the music of some of his disciples (e.g. Berg, Haug, Kfenek, Pisk, Webern, Wellesz) are based. It abolishes keys and with them the predominance of certain notes in a scale (tonic, dominant, subdominant, and mediant), using instead the twelve notes of the chromatic scale, each of which has exactly the same importance as any other. This rules out any feeling of tonality and also discards the resource of modulation, so important to musical structure in the classical sense.

**Twelve Patriarchs, Testaments of the**, a series of writings purporting to give the dying speeches of the twelve sons of Jacob. Each speech develops into an exhortation to avoid some particular sin or practise some special virtue. It is a Jewish work of the second century B.C., but early underwent Christian interpolation. It is referred to by Tertullian and Origen.

**Twelve Tables, The** (Rom. Law). The Duodecim Tabule or T. T. was the earliest code of Rom. laws and was mainly the work of the decemvirate formed expressly for the purpose of evolving such a code (303 A.U.C. or 451-449 B.C.). The code was the outcome of the successful revolution by which the *plebs*, as opposed to the *patricians*, were enabled to insist on a changed polity giving them power and office and an opportunity for preparing a permanent body of law. The decemvirs comprised an equal number of patricians and plebeians, and their task was to collect and embody in the shape of written law all those portions of the customary law which it was most essential for the administration of justice should be perpetuated; and to promulgate or pub-

lish the laws so incorporated or codified for the benefit or the whole body of citizens.

The praise which legal posterity in Rome bestowed on the T. T. would lead the student to expect a very different *corpus juris* from that which has actually been handed down in extant fragments. They are not a systematic exposition of Rom. public and private or municipal law as it existed before the irruption of the Gauls; nor is there to be found in them that infiltration of the foreign element which would endow the T. T. with a cosmopolitan or universal character sufficient at all events to merit Cicero's extravagant eulogy of them as 'almost the perfection of human wisdom.' Beyond the possible source in the laws of Solon of certain provisions relating to funerals, foreign sources, such as later were used with such profound effect by the prætors (see *JUS GENTIUM*), are nowhere to be traced. The T. T. in fact merely contain short statements of those points of law which the daily affairs of the average citizen required to be determined and publicly announced. Of necessity these statements were founded on previously existing tradition or custom, and a few of these vague or floating customs had actually been engraved on tablets and publicly displayed. But the T. T. did not codify or incorporate the whole of the pre-existing body of custom, their primary purpose being rather to meet the more pressing exigencies of the time. But in any case they provided an enduring foundation on which was subsequently reared the whole edifice of the Rom. Law of future periods and, as such, they are most justly celebrated. Legal historians emphasise the fact that the T. T. clearly recognised four important forms of action, viz. *sacramentum*, once the sole form of action which was available to enforce every kind of right known, and remarkable for a series of symbolic acts and words that are characteristic of most early legal systems; the *judicis postulatio*, a mode of action to settle boundaries; *manus injectio* (laying on of hands), symbolic of the remedy *in personam* or the deprivation of the defeated person of his liberty; and *pignoris capio*, which had to do with taking pledges to satisfy a debt. The T. T., in fixing and promulgating the law, were unquestionably a source of considerable strength to the *plebs*, though the decemvirate, regarded as a crisis in their political development, was not favourable to them, and it was only very gradually that all inequalities between them and the *populus* disappeared. In the study of Rom. Law, however, the fragments of the T. T. which are extant, together with the writings of Gaius (*q.v.*) and Cicero, and of other jurists such as Ulpian, are of the highest value in enabling us to ascertain the essential features of the private Rom. Law at a period before it had become moulded to a more matured culture. See Livy, iii. 31-37, Cic., *De Leg.* 11.; *Rep.* ii. 37, 63; Gaius, *Dig.* x. 1; xlvii. 22, etc.; L. Schoell, *Legis Duodecim Tabularum*; *Reliquiæ*, 1866; H. J. S.

Maine, *Ancient Laws*, 1861; and L. Hunter, *Introduction to Roman Law*, 1880.

**Twickenham**, municipal bor. of Middlesex, England, on the l. b. of the Thames, opposite Richmond, a residential suburb of London. In 1926 T. became a bor., with a mayor and corporation in place of the previous urban district council. In 1937 the former urban dists. of Teddington, Hampton, and Hampton Wick, were amalgamated for municipal purposes into a Greater Twickenham, thereby more than doubling the population of the bor. (estm. in 1948 at 108,000). Much damage was suffered from enemy action especially in 1940, but the redevelopment of the damage areas is planned conformably to the lay-out of the bor. The earliest historical record of T. is 704 when land here was granted to Waldhere, bishop of London. The parish church of St. Mary's was founded in the fourteenth century, but the tower is the only portion remaining of the original structure. This tower, the chief historic monument of T., was built by William of Wykeham. The church contains a monument to Pope, who is buried here, and another to Kitty Clive (*q.v.*). Catherine of Aragon, during her divorce troubles, lived at the Manor House (opposite the par. church) prior to 1536. T. is noted for its literary associations: Francis Bacon owned Twickenham Park House and in 1592 lived there to avoid an epidemic in London. At Pope's Villa, in Cross Deep, many literary celebrities were wont to meet. John Gay resided at Marble Hill, the grounds of which were laid out by Pope. Lady Mary Wortley Montague came to live at T. in Heath Road in 1718. In a wooden house in Black Lane, on a site now marked by Fielding Cottages, Henry Fielding wrote *Tom Jones*, and Tennyson lived for some time at Tennyson House, Montpellier Row, in the years preceding his marriage.

York House, the municipal headquarters, derives its name from the fact that it was a country seat of the Duke of York, afterwards James II. Other features of T. are Kneller Hall (*q.v.*) built by Sir Godfrey Kneller (*q.v.*); and Strawberry Hill, which includes the famous mansion of Horace Walpole, now a Rom. Catholic training college for teachers, known as St. Mary's College.

**Twilight**. The diffused daylight which precedes and follows the passage of the sun above and below the horizon respectively is due to refraction, reflection, and dispersion of the light of the sun by the atmosphere, chiefly by means of the dust and water particles contained. Its brightness varies with these conditions, but mostly with the distance of the sun below the horizon; when the sun is well below the horizon the light may have been reflected many times. Two parts of T. are recognised: *civil twilight*, when the sun is more than 6° below the horizon and the light is considered insufficient for outdoor work; and *astronomical twilight*, which was determined in the eleventh century as when the sun is more than 18° below the horizon. Beyond the

Arctic and Antarctic circles T. increases according to season, extending over many weeks in the spring and autumn. Owing to the increasing angle at which the sun approaches the horizon towards low lat., the duration of T. decreases; it decreases also with altitude. At Quito in Ecuador it is no more than twenty minutes.

**Twilight Arch**, the arched boundary right across a clear sky along which its colour or brightness changes appreciably. Normally T. A. is restricted to the transition between bright and dark sky, which is also known as the *Shadow of the Earth*.

**Twilight Sleep**, see under SCOPOLAMINE.

**Twill**, woven fabric in which the warp is raised one thread and depressed two or more threads for the passage of the weft.

**Twinkling**, see SCINTILLATION.

**Twins** generally denote two individuals produced at one birth. The term is used also to describe two similar and equivalent objects, e.g. twin crystals. In its strictest sense, however, the word denotes the result of the div. of an organism or of an organ into two equivalent organisms or organs. In consequence, although two animals may be developed and born at the same time, they are T. only if they are the products of the div. of a single fertilised ovum. Human 'twins' resulting from the synchronous development of two fertilised eggs are not true T. True T. are always of the same sex, like the Siamese T. are frequently conjoined, and often the organs of one are arranged as mirror images of those of the other. Not infrequently one individual is larger than the other, whether the T. are separate or conjoined. Most conjoined T. have separate organs and are connected only by the body wall. Comparatively few early stages in the development of human T. from a single egg have been observed, but evidence shows that T. may develop in one of three ways: (1) The fertilised ovum divides to form a mass of cells, the blastula. This may divide into halves which develop separately. (2) From the blastula, two gastrulae may be formed and develop into two individuals. (3) Early in development fission may occur along the axis of the embryo and so give rise to two partially or completely separate individuals. There is some evidence to show that the tendency to beget T. is inherited by male.

**Two-stroke Engine**, see under MOTOR CYCLES.

**Two Sicilies, Kingdom of the**, see under SICILY.

**Two-toed Sloth**, see SLOTH.

**Tyburn**, name formerly applied to the gallows in Middlesex, Eng., which stood at the W. end of Oxford Street, London, derived from T. stream. The last execution took place there in 1783. See A. Marks, *Tyburn Tree*, 1908; G. L. Gomme, *Tyburn Gallows*, 1909.

**Tycho**, see FORTUNA.

**Tycho**, see BRAHE, TYCHO.

**Tyldesley**, urban dist. of Lancashire, England. The chief industries are cotton spinning and coal-mining. Pop. with Shakerley 18,500.

**Tyler, John** (1790-1862), Amer. statesman, tenth president of the U.S.A., b. in Charles City, Virginia. He was called to the Bar in 1809, and in 1811 he was elected a member of the Virginia House of Delegates. In 1816-21 he was a member of the national House of Representatives, and in 1825-27 governor of Virginia, becoming a senator in 1827, when he showed his hostility to a high tariff policy. In 1840 he was elected vice-president, succeeding Harrison for the next year as president, in which capacity he stood as it were midway between the two great parties, without the support of either, for though he frequently showed himself in sympathy with the Whigs he was never wholly one of their number; the Whigs themselves refused to acknowledge him as a member of their party. Besides the Ashburton Treaty, the most important act of his administration was the annexation of Texas in 1845. His last years were devoted to the Confederate cause. See L. G. Tyler, *Letters and Times of the Tylers*, 1884 95.

**Tyler, Wat** (Wat the tiler), leader of the men of Kent in the rebellion of 1381 in Richard II.'s reign. He had slain a tax-collector for gross insult to his daughter, which incident had brought discontent in the S.E. to a climax. The rebels marched on London, releasing the priest John Ball from Maidstone Gaol en route. They burnt Southwark Prison, plundered Lambeth Palace, broke into the Tower, and killed the archbishop of Canterbury and Sir Robert Hales. At length T. and his men met the king at Smithfield, where the Mayor of London, Sir William Walworth, slew T.

**Tyler**, city in Texas, U.S.A., 100 m. E. by S. of Dallas. It has various manufs., and is situated in a prosperous agric. region. Pop. 28,300.

**Tyler, Sir Edward Burnett** (1832-1917), Eng. anthropologist, b. in London. He travelled in America in 1855, and the following year visited Mexico, where he became interested in the prehistoric remains and took up the study of anthropology. He recorded his observations in *Anahuac; or Mexico and the Mexicans Ancient and Modern* (1861); which was followed by *Researches into the Early History of Mankind* (1865); *Primitive Culture* (1871); and *Anthropology* (1881).

**Tympanites**, see HOOVE.

**Tympanum**, in anatomy, the membrane between the external and the internal ear, sometimes called the drum of the ear.

**Tynan, Katharine** (Mrs. Katharine Tynan Hinkson) (1861-1931), Irish poet and novelist, b. in Dublin, and educated at a Droghda convent. She began writing at the age of seventeen, and was prominent in the so-called Celtic Revival at the end of the nineteenth century. Her novels include *The Dear Irish Girl* (1899); *A Daughter of Kings* (1905); *Her Ladyship* (1907); *Lost Angel* (1908); *The Middle Years* (1917); *The Infatuation of Peter* (1926); *The Wild Adventure* (1927); Her books of poems include *Innocencies* (1905); *Experiences* (1908); *Lands* (1908);

*Irish Poems* (1913); *Collected Poems* (1930).

**Tyndale, William** (c. 1490–1536), Eng. translator of the Bible, was a native of Gloucestershire. In 1521 he became the chaplain and tutor in a household at Old Sodbury in Gloucestershire, but his sympathy with the new learning aroused suspicion and he removed to London; but finding it impossible to complete his trans. of the N.T. in that city, he went to Hamburg and ultimately to Cologne, where in 1525 he began printing the work. In 1528 he pub. *Parable of the Wicked Mammon* and the *Obedience of a Christian Man*, and was for a time in Henry VIII.'s favour, but having pub. *The Practice of Prelates* in 1530, he lost the king's goodwill. He was burnt as a heretic. His fame rests upon his trans. of the Bible, consisting of N.T., Pentateuch, and Jonah. See lives by R. Doanias, 1871, 1886; W. B. Cooper, 1924; and J. F. Mozley, 1937.

**Tyndall, John** (1820–93), Brit. physicist, b. at Leighlin Bridge, co. Carlow, Ireland. In 1848–50 he studied at Marlburg under Bunsen. He made important investigations in the Penrhyn slate quarries and in the Alps with Huxley, the result of their labours appearing in *The Glaciers of the Alps* (1860). In 1859 he began his researches on radiation, and later took up the subject of the acoustic properties of the atmosphere. He was president of the Brit. Association at Belfast in 1874, and for some years was scientific adviser to the Board of Trade and to the light-house authorities.

Outside scientific circles, T. is remembered chiefly for his challenging address, before the Royal Institution, *The Influence of Material Aggregation upon the Manifestations of Force* (1853), in which he claimed for matter the promise and potency of every form of life. Others of his works are: *Heat as a Mode of Motion* (1863); *Fragments of Science*, 1871 (1879); *Floating Matter of the Air* (1881); *Lectures and Essays* (1903). See life by A. S. Eve and C. H. Croasey, 1945.

**Tyne**, riv. of N. England, formed by the junction of the N. and S. Tyne near the vil. of Hexham, Northumberland, flowing E. to the North Sea at Tyne-mouth. Its total length is 45 m., and its prin. trib. is the Derwent. Newcastle and South Shields are the chief tns. on its banks. The N. Tyne rises on the Scottish border, and the S. Tyne has its source near Crossfell in Cumberland. The lower reaches, with such tns. as Jarrow, Gateshead, and Newcastle, is an important industrial area, especially for shipbuilding; depression in this latter industry during the 1930's caused great distress in the area.

**Tyne Tunnel**, see under JARROW.

**Tynemouth**, municipal, co., and parl. bor., seaport, and mkt. tn. of Northumberland, England, on the R. Tyne. An important seaside resort, its sands are overlooked by picturesque cliffs. Within its boundaries is the important shipbuilding tn. of North Shields (q.v.). During the trade slump after the First World War

the dist. suffered acute distress. To avoid the recurrence of this the W. Chilton Trading Estate has been estab. by the Council and it includes among its industries those of plastics, clothing, die-casting, confectionery and furniture. T. and the adjoining vil. of Cullercoats are almost entirely residential areas. Pop. 66,100.

**Tynwald**, legislative body of the Isle of Man, which with the Lieutenant-governor, the Council, and the House of Keys constitute the gov. The Tynwald Court controls the surplus revenue and appoints boards to manage the harbours, highways, education, local gov., and asylums, subject to the approval of the lieutenant-governor.

**Type**, in chemistry, system used for indicating the structure of certain organic compounds, which were regarded as derived from sev. simple inorganic bodies by the introduction of various radicals. Gerhardt referred almost all substances to four typical molecules, viz. hydrogen, H; hydrogen chloride, HCl; water, H<sub>2</sub>O; and ammonia, NH<sub>3</sub>. Kekulé added a fifth T., methane, CH<sub>4</sub>. Williamson introduced condensed Ts., and Frankland from the T. theory was led to the theory of valency (q.v.). The term is now obsolete.

**Type**, in theology, see under ANTITYPE.  
**Type and Typefounding**. As in the earliest days of most handicrafts the craftsman made his own implements and apparatus, so in the inception of typography the printer was his own typefounder; in fact it was not until the seventeenth century that the arts of printing and letter-founding were separated. In the second vol. of *Mechanick Exercises*, by Joseph Moxon (1683), is a very full and practical account of the making of type in his day, and the process remained much the same until the introduction of machinery for the purpose in the middle of the nineteenth century, and with some modifications in the mould is still to a minor extent in use for the casting of small quantities of seldom-used sorts. Before describing the mould it will be necessary to give a description of the matrix, from which the face of the type is cast, and the punch, by means of which the letter is stamped into the matrix. The punch is a rod of steel about 2 in. long by  $\frac{1}{2}$  in. square for pica and smaller sizes, and upon the end of this the letter has to be engraved after the face has been ground true on an oilstone. The outlines having been marked out, the counters are struck in with counter-punches; as the work proceeds impressions are taken in smoke on a smooth paper and compared with the model; this refers to hand-cut punches, but towards the end of the last century machinery was introduced which quickly produces the punches with an accuracy impossible in hand work. The matrix is a small oblong piece of copper, on one side of which and near one end an impression of the die is struck, after which the matrix requires careful adjusting that the impression may be of the correct depth and be in exactly the right position and in perfect alignment with the rest of the fount. In original hand casting the

mould was made in two equal sections, of wood lined with iron, and each size of body required a different mould, though the width could be regulated to the width of letter required. When the two sections of the mould were joined in position, with the matrix in its place, a small chamber was left, having for its base that portion of the matrix on which the letter had been struck, and at its top a small hole with a funnel-shaped opening, into which the metal was poured as each type was cast, when, with a peculiar jerk of the left hand, which held the mould, the metal was sent right home to the deepest point in the matrix. When, on the metal cooling, the mould was opened, releasing the type with a tag of metal at the foot—the small quantity which was in the funnel-shaped opening of the mould—this had to be broken away, and afterwards a groove was cut across the bottom of the type where the tag had been. (For type-casting by machinery, see TYPE-CASTING AND TYPE-SETTING MACHINES). The principal element in type metal is lead, varying from 89 per cent in Moxon's formula to 55 per cent in some modern ones, but the proportion is made to suit the size and character of the type to be cast. The other principal ingredients are tin and antimony, besides which copper, nickel, cobalt, iron, and bismuth have been used. When it is considered that a small type may run not less than twenty-four lines to 1 in., it will be seen what accuracy must be maintained in the moulds to get the body of each type to the standard size, and in the matrices that the alignment of the face and the thickness of line may be constant.

Moxon gives only ten sizes of type, and of these there are two groups of two, of which one is the double of the other, and one group of three, Eng., two-line Eng., and great Cannon, where the latter equals four-line Eng., but there is no correspondence between the various groups. By the introduction from America of the point system a method was adopted showing the relative sizes of all types, the point being fixed as the 72nd part of an in., and sizes named by the number of points, thus effecting the standardisation of the depth of the types. Point size refers to the depth of a type body measured column-wise. Set size, or thickness, is the width of a type body. The varying set of different letters is inherent in the alphabet we use; *i* and *w* must be cast on different thicknesses of body, but these are now being made proportional. It is to be noted that in typesetters' parlance each portion of a single type has its own special name.

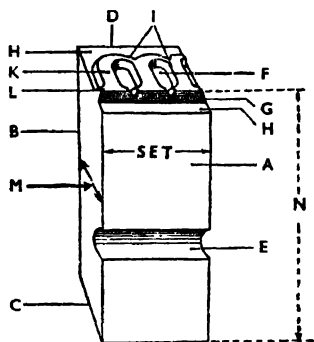
There are now two standardised sizes of different types in use in the various countries of the world. One is the American 'point' system in use in America and the English-speaking countries; the other is the French 'Didot' system in general use on the European continent. The table opposite gives the traditional 'English' names and the measurements of the point system:

	English	Point	Inch	Lines to 6 picas (Approx. 1 in.)
		1	·013833	72·00
		2	·0276	36·00
Minikin ..	..	3	·0414	24·00
Brilliant ..	..	3½	·0484	20·62
Gem ..	..	4	·0553	18·00
Diamond ..	..	4½	·0622	16·01
Pearl ..	..	—	·066	15·15
		5	·0691	14·40
Ruby (Agate) ..	..	5½	·0760	13·08
		6	·083	12·00
Nonpareil ..	..	—	·0833	11·95
Emerald ..	..	6½	·0899	11·07
		7	·0968	10·28
Minion ..	..	—	·0972	10·24
Brevier ..	..	—	·1083	9·19
		8	·1107	9·00
Bourgeois ..	..	—	·118	8·44
		9	·1245	8·00
Long Primer ..	..	—	·135	7·22
		10	·1383	7·20
Small Pica ..	..	—	·145	6·86
		11	·1521	6·66
		12	·166	6·00
Pica ..	..	—	·1687	5·97
		13	·1798	5·54
English ..	..	—	·188	5·29
		14	·1936	5·14
2-line Brevier ..	..	—	·2166	4·59
		16	·2213	4·50
Great Primer ..	..	—	·235	4·23
		18	·249	4·00
Paragon ..	..	—	·2626	3·79
		20	·2766	3·60
Double Pica ..	..	—	·289	3·44
		22	·3043	3·27
		24	·332	3·00
2-line Pica ..	..	—	·3362	2·96
2-line English ..	..	—	·375	2·65
		30	·415	2·40
		36	·488	2·00
		42	·581	1·71
		48	·664	1·50
		54	·747	1·33
		60	·8301	1·19
		72	·996	1·00

The Didot body (*corps*) is smaller than its point equivalent, e.g., *corps* 6 has 11 21 lines to 6 picas (approx. 1 in.).

**Type Design.**—The names of the various parts of the face of type are shown in the diagram on page 443.

In considering the beauty of type and its legibility there are various things to be taken into account: the correct placing of the line on the body, so that the beard may be deep enough for the descending letters, and in the lower case that the face of the short letters should leave just the right proportion of space for the ascending letters; that the italic or any other face to be used with the roman should be in exact alignment with it; that the main strokes and hair lines should bear a due proportion to one another; and in the curved letters there should be that 'sweet driving of the fats and the leans into one another' of which Moxon speaks; and this letter characteristic should also be found in the joining of the serifs to the



NAMES OF TYPE FEATURES

A, Front (of body), B, back (of body); C, foot; D, head; E, neck; F, counter; G, beard (shows depth of drive); H, shoulder; I, hair line; K, main stroke; L, serif; M, point size; N, height to paper (distance from the surface on which the feet of the type rest to the face, *i.e.*, the surface which takes the ink and prints the paper).

main stroke. Pounts of type used for bookwork may be classed as the *old face*, the *old style*, of somewhat lighter face and more regular appearance, and the *modern face*; and with the roman of each of these faces there is the corresponding italic. Besides these faces used for bookwork there are very many fancy faces used for jobbing work, such as circulars, bill heads, cards, and advertising purposes, and the above-mentioned, as well as the fancy faces, are made not only to the standard set or thickness, but extended or condensed. The standard thickness is judged by placing the whole alphabet, a to z, in line, when they should measure about 12½ ems of their own body. Again, besides the letter faces of type there are chess and draught faces, playing card and dice faces, music faces, shorthand faces, and many others. The system of logotypes, or types bearing a combination of letters frequently occurring in conjunction, has been tried, notably that under the patent of Henry Johnson, which was adopted by *The Times* in 1782, but apparently was not found to be so great a success as was anticipated. Indeed, unless such a combination occurs more frequently than the least used of the letters, it cannot be a time-saving device. The logotypes actually in use are fi, fl, ff, fl, and fl.

See T. Baines Reed, *A History of the Old English Letter Foundries*, 1887, (ed. by A. F. Johnson), 1950; G. Pollard, *Catalogue of Typesetters' Specimens*, 1928; and D. Thomas, *Type for Print* (2nd ed.), 1950. See also bibliography of TYPOGRAPHY.

**Type-casting and Type-setting Machines.** When machinery was introduced for type casting, it was necessary to find some means of forcing the metal into the matrix,

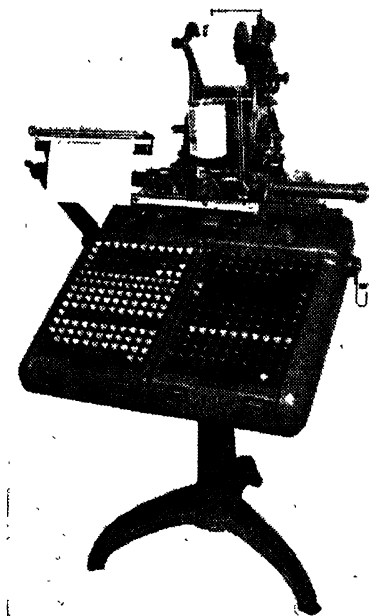
which in hand casting had been done by a jerk of the hand after the metal had been poured into the mould from the ladle, and the pump was introduced for this purpose in the early part of the nineteenth century. It was also obvious that if any speed was to be maintained it was necessary to cool the mould by some artificial means: the expansion of compressed air was recommended for this purpose by Brunel, but at the present time water is generally used. The earliest machines for casting type followed closely the hand method, in that the mould was in two parts and was made to approach the nozzle of the pump, to recede from it when the metal had been delivered, to open and eject the type, repeating this action for each type cast. Such machines are still in general use, with the mould working on a pivot to and from the pump, with various cams to effect the opening and closing of the mould and the delivery of the type when cast. They were originally worked by a hand wheel, but now are made to use power, the various actions being controlled by springs. The type turned out by the hand machines, moreover, needs finishing after delivery. The improved pivotal machines, worked by power and water cooled, now turn out the finished type ready for use at the speed of 3000 ems per hour for pica or 12 pt., or 7000 ems for nonpareil or 6 pt.; of course, with the larger sizes of type the production is much slower, as the type in the mould takes longer to cool. The Wicks Rotary Type-Casting Machine was a vast improvement on any previous type-caster, and was constructed on an entirely different principle. Its chief characteristic is the mould wheel, working on a vertical shaft, and having 100 radial moulds. The type was cast in these moulds and ejected on to a delivery chain. According to the size of the type to be cast the speed of this machine varied from 30,000 to 60,000 per hour. The 'Super Caster' is the latest development of type-casting machinery, the product of which is not confined to casting type, for on it may be cast leads and rules in continuous strip, automatically cut to desired lengths, quotations, furniture, single or continuous borders, and much other material used by the compositor.

**TYPE-SETTING MACHINES.**—These may be classed as: (a) those that set type that has been cast by some other machine; (b) those that cast their own type in the order in which it is required for printing the special work in hand; and (c) those that assemble the matrices for a complete line and then cast that line in a single slug. The first mentioned was the earliest invention and has been superseded by machines of the other two types. Of the second class of type-setting machines 'Monotype' machinery may be taken as an example.

**Monotype.**—These consist of two separate parts, a keyboard, which perforates rolls of paper (a translation of the copy into a series of perforations), and a caster, which these perforations guide in its automatic working. The keyboard is

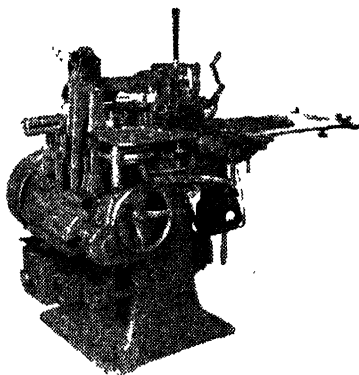
similar to that of a typewriter, and the characters are arranged on the same plan, but it is double and contains 301 keys, an arrangement of different colours indicating whether they belong to roman or italic; caps., small caps., or lower case; figures or sorts (special or unusual characters). Above the keyboard is a roll of paper which is fed from one spool to another  $\frac{1}{4}$  in. at the completion of each letter. Behind the keybanks is a series of 31 punches, and a combination of the positions of any two perforations from 28 of these punches is used to represent the different letters and spaces; one key, the quad, does not perforate. Depressing a key actuates valves to liberate compressed air, which sets in motion the required punches. Whilst the perforations for a line of type are being made a device is registering the thickness of every letter composed and counting the number of spaces, and at 4 cms before the completion of a line a bell rings, so that the operator may see if he can complete the word in hand or whether he shall divide it,

which two keys are to be used to effect the justification of the line, which is accomplished on the caster, by the setting of two wedges which divide the surplus space over the number of spaces in the line. The perforated ribbon is now ready to go to the caster, where it is paid in from the end and works backwards, for it is necessary that the justification wedges should be adjusted first or the spaces would not be cast to the correct width.



STANDARD MONOTYPE KEYBOARD

or if the word is completed whether the next will come in complete or divided. Having included all that the line will contain, the line will need justifying. As the line approaches completion, the justifying drum rotates until it shows, by means of two figures one above the other



MONOTYPE CASTING MACHINE

The matrix case on the caster consists of a frame carrying 255 matrices, arranged in 15 rows with 17 matrices in each row, and each matrix is brought to casting position by the influence of compressed air passing through the combination of two corresponding perforations.

The ribbon perforated at the keyboard is transferred to the caster, and is fed to a take-up spool in a direction reverse to that in which it was perforated. The ribbon is led step by step beneath a tracker bar, and intermittently clapped over a series of 31 holes above 31 corresponding pipes. Where perforations occur the compressed air is conducted to beneath stop pins arranged in two groups at right angles to each other, so that a stop pin will rise on each block. Working over each group of stop pins are two sets of tongs, which reciprocate during each revolution of the caster. The first pair of tongs causes a pair of jaws to contact the raised stop pin, at the same time taking a stop rack with it. This rack is immediately locked, and as the second pair of tongs meet, the jaws connected to them bring the matrix case up to the position indicated by the stop rack. The stop rack is then released ready to be taken to the next elevated stop pin.

In the meantime, as the matrix case is brought to position, a wedge is moved to a corresponding position for the purpose of limiting the distance to which the mould blade may be withdrawn, so that the type next to be cast will be correct to size.



The matrix case then descends towards the mould, and a coned pin clamps the required matrix on to the mould in its exact required position, and a piston then pumps the metal into the mould producing a type body with the characters shaped at the head. A trickle of water through the mould causes the metal to be instantly solidified. The matrix case then leaves the mould, permitting the type to be ejected, leaving the mould ready for the next cast to be made.

The types are ejected into a narrow channel, one by one, until the line is complete, and the justification perforations at the end of the next line are reached. These cause two further wedges to be adjusted, so that all the spaces in the next line will be cast true to size to make the line correct in width, and the casting of the next line is then proceeded with in similar manner. The types may be cast at the rate of 140 a minute for 12-point up to 180 a minute for 6-point or smaller, and the width of line may be cast up to 60 ems pica.

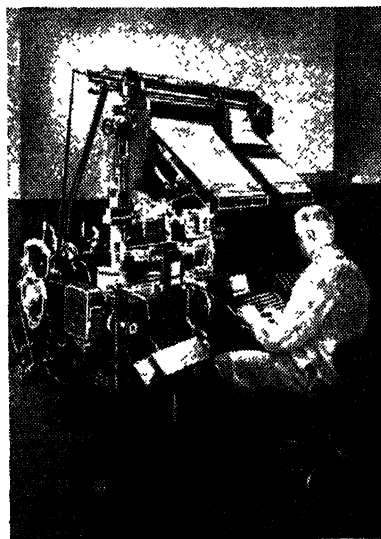
*Linotype.*—Of the third class of machine the 'Linotype' may be taken as typical. It creates lines of metal, known as slugs, which can be used for direct printing, or, as in newspaper work, for making papier-mâché moulds from which stereotype plates are produced. Each of these lines

After use, these slugs are melted down and used for recasting into other slugs. The practice of returning every single type character and space to its particular box, as with handset type, is thus entirely eliminated.

The dominant feature of the Linotype is the individual freely circulating matrix. A matrix consists of a flat plate which has on its vertical edge die or dies of a character, and has in its upper portion a series of teeth which are used for selecting and carrying it to its proper place in the magazine or container. This container has a series of grooves or channels along which the matrices slide on their edges and from its lower end they drop one by one when released by the depression of a key button.

A keyboard is used for assembling these various matrices in the order required for making words. When the operator depresses a key, it releases a matrix from the container or magazine above. The matrix falls down on a constantly revolving belt into a box, which represents the stick of the hand compositor. After each word, a spaceband is inserted by depressing a key. When the matrices and spacebands have been assembled to fill a line, the operator raises the whole line by depressing a handle on the right. Thereafter the entire operation of casting the line and returning the matrices to their original places is effected mechanically, and the operator can therefore begin to assemble the next line. The line is transferred to the front of the mould, which is slotted from the front to the rear and is of a size determined by the body and length of slug to be cast. While the line of matrices and spacebands is in front of the mould, the spacebands, which are double wedge-shaped, are spread upwards until the line is spaced out to the required measure. At this moment the slot in the mould and the dies of the row of matrices are filled with molten metal to produce a slug. The molten metal is contained in the pot behind the mould wheel, and is kept in a molten state within by a bunsen gas flame or by electrically heated elements. The molten metal is forced into the mould and the matrices by a plunger, which pumps the metal up the delivery mouth into the mould where it solidifies and forms a slug.

After casting, the mould wheel containing the slug revolves and brings the slug into a vertical position, where it is pushed by an ejector through two parallel trimming knives into a tray or galley. At the back of the mould wheel is a knife which trims the bottom of the slug. While the slug is being trimmed and ejected, the matrices and spacebands, having finished their work, are returned for use to their original places. The matrices are first lifted vertically to an intermediate channel, thence they move laterally to the right until their teeth engage in the ribs of the bar which has descended to receive them. This bar then rises and lifts the whole line of matrices to the distributor mechanism at the top of the magazine. In the meantime the space bands which



LINOTYPE MACHINE AND OPERATOR

of metal or slugs is the length and width of a line of type, and has on its upper edge the necessary type characters to print an entire line. Several lines of slugs produce the same appearance as lines of type which are composed of single types and serve exactly the same purpose.

have remained behind (because they have no teeth to engage in the bar) are transferred by a grabber to their original position in the box for use again.

The method by which each matrix is returned to its proper channel in the magazine is as follows: Each matrix has a number of teeth in the V formed by its top portion. These teeth are not the same in every matrix, but are arranged in a particular order or combination according to the characters they bear. Every character differs in its combination from a matrix bearing a different character, and the teeth play an important part in effecting the return of the matrices to their respective places. A rigid notched bar is fixed in position above the open ends of the magazine mouth, and is so made as to engage the teeth and hold them in suspension. The ribs of the bar vary in number and continuance along its length. The matrices are pushed on the bar at one end and carried along it over the mouths of the channels. Each matrix is engaged by its teeth on the bar until it arrives over its proper channel, where the combinations of teeth allow the matrix to disengage so that it falls into its own channel. The matrices are carried along the bar by means of longitudinal screws, which lie below the bar in such a position as to engage the edges or lugs of the matrices and carry them along the bar. It is this system of the circulation of matrices and the fact that the operations of assembling them in one line, casting from them in another, and carrying them back to the magazine are concurrently effected without interference, that enables the machine to be operated at a speed far beyond that hitherto attainable in type composition.

Another type of machine in this class is the *Intertype*, which resembles other line composing machines only in general appearance and operating principles. One operator on an Intertype composes and casts type matter of all descriptions, ready for printing, in sizes from 5-point to 60-point, as well as rules and all kinds of decorative and spacing material. As many as 586 characters are available from one Intertype keyboard, and up to twelve 'faces' or styles of type. The type is cast, a line at a time, from brass matrices. Up to twenty matrices of each letter or character to be composed are stored in magazines and released mechanically one at a time by the operator's touch on the keyboard. The released matrices are conveyed in correct order to an assembler (resembling the compositor's 'stick'), with wedge-shaped spacers between the words. When the complete line is assembled, the operator releases it to the casting portion of the machine, where it is automatically justified against a mould of correct size and molten metal is pumped into the mould and matrices to form the line. The latter is then trimmed to dimensions accurate to within one-thousandth of an inch, and in its turn assembled on a galley in column or page form. Meanwhile, the machine automatically 'distributes' the used matrices

and spacers back to their respective magazines ready to be used over again. The complete cycle of machine operations as here described happens seven times each minute. The outstanding feature of the Intertype is its simplicity when compared with other machines of its class. Included in the Intertype series is the *Intertype Fotosetter*, which sets type photographically as distinct from the setting and casting of type by means of the hot metal machine.

**The Ludlow System of Composition.**—This is essentially employed for the casting of display lines, with a comprehensive range of type faces in sizes from 6 point to 96 point. The units of the Ludlow which make it a complete composing room system are the machine, cabinets that each hold twenty fonts of matrices, spaces, and sticks. The complete necessary equipment can be contained in a floor area of only 10 ft. by 6 ft. With the Ludlow system of composition, individual brass matrices are set or 'gathered' by a hand compositor from the matrix cabinet, and placed face downwards in a special stick, rectangular in shape with a screw clamp at the end. The 'gathering' of matrices is much quicker than picking up one type or one matrix at a time. This stick or matrix holder is then inserted in the machine which ejects a certain amount of molten lead alloy through a mould into these matrices. The character contained on the working face of the matrix is faintly embossed on the back, together with an identification line, so the compositor can check the line.

Whatever the face size required, type lines may be cast on the Ludlow without mould, magazine, or other machine changes, since any variation in face-size is provided for by an overhang cast on both sides of the slug shank. This overhang is of ample thickness and strength, and is further reinforced by blank slug underpinning. From end view the Ludlow slug is T shaped.

The machine is 4 ft. wide, 3 ft. 6 ins. high and 3 ft. from back to front, and has an electrically heated and automatically fed metal pot. The metal usually used is an alloy of 4 per cent. tin, 12 per cent. antimony and 84 per cent. lead, with a working temp. about 55° F. The machine is driven by a  $\frac{1}{2}$  h.p. motor, which also drives a small water pump circulating the water through the mould, keeping the mould relatively cool, and enabling repeat castings for as long as required at the rate of 6 slugs a minute. In general practice only two body sizes of moulds are used, 6 pt. and 12 pt., both 24 cms in length.

**Typewriter**, writing machine operated by hand for producing characters similar to those of printing. The T. in its modern form was invented about 1870 by three men, Scholes, Glidden, and Soule, working together, their experiments being financed by Densmore. Glidden and Soule retired from the experiments, and afterwards Yost was called in to express an opinion as expert mechanic. Acting on his advice Densmore and Scholes took the machine

to the Remington Company, gunmakers, who had suitable tools for making such a machine economically. Remington's took it up and gave it their name, hence the Remington T. It is interesting to note that Scholes, Densmore, and Yost, all invented other T's afterwards.

All T's for letter writing are alike in having keys which are depressed by the finger, thereby setting in motion certain levers and causing a letter to make an imprint on paper or other material. The imprint is made by the type striking an inked ribbon interposed between it and the paper. In some early machines, for example the Yost, an inked pad was used in place of the ribbon, the type rested on this and when the key was depressed carried sufficient ink on its surface to leave an impression on the paper. This method is now obsolete. The paper is fed round a cylinder called the platen, between it and small feed rolls. The letters all strike one spot, so the platen must move after each letter is used. It must also move to allow a space between words. This is done by the space bar, situated between the lowest row of keys and the frame of the machine. The platen is mounted in a carriage which is made to move in the direction of its length, and the platen revolves on an axle in the carriage, thus allowing the paper to be moved up at the commencement of a new line. The movement of the carriage is automatic and is caused by a coiled spring retained in a housing or drum to which is attached a fabric or cord drawband, this in turn being connected to the end of the carriage. By means of a ratchet attached to the centre spindle the spring may be wound to give the desired tension. A toothed rack running the length of the carriage engages a pinion which, by means of an escapement wheel and rocker, ensures that the carriage moves precisely one space on the operation of key lever or space bar. The revolving movement of the platen is made by the action of the lever provided to return the carriage to the position to commence a new line. The mechanism causes the platen to revolve a certain fixed distance, and this distance determines the space between the lines. Usually there are three of these fixed distances or spacings single, double, or triple.

Modern T's are all front stroke machines, and most of them employ a typebar, which is threaded on to a fulcrum wire passing through a shaped segment, the centre bars being almost straight and the angle of the heads becoming more acute as the bars at each end are reached. In this way it is possible to get the 45 or so bars necessary to give all the characters required in a comparatively small arc. Some machines, now obsolete, had the type on a drum, or alternatively a semi-circular band of metal, the key action causing this to move until the letter depressed was opposite the platen and in position for a comparatively short stroke on to it. These drums and bands were, on some makes, easily changed enabling one to have various style types on the

same machine. Another method, as in the Oliver, employed inverted U shaped bars in plain bearings, the bars being arranged in banks each side of the machine and being drawn down to a central writing point by the action of the key levers. Yet another method still in use to-day is for each typebar to have a small ball-race at the fulcrum point, the lower part being fixed by screws and plates to a vertical piece of metal running across the machine.

A modification of the front stroke machine is the Noiseless, which, as its name implies, is designed to operate with the minimum sound possible. This is achieved by arranging that steady pressure exerted on a key brings the bar up just short of the point of impact, when the key is struck staccato a weighted cam causes the bar to continue its travel after the actual finger pressure has reached its limit and so impresses the type, through the ribbon on the paper.

Various methods have been tried to ensure the correct alignment of type, for not only is it necessary to have the letters equidistant but they must also be 'on feet,' that is give an even impression over the whole of their surface, and the base of each letter must be in line with its fellows, with the exception of course of those which in the small characters extend below the line. To-day the general practice is to employ a type fork or guide into which the neck of the typebar enters just before the bar reaches the writing point.

The ribbon is mounted on two spools and passes through a guide behind the type fork. The spool that is driving is connected to the mechanism so that it moves the width of one letter each time a key is depressed thereby causing the type to strike a different place each time. T's are now fitted with an automatic ribbon reverse so that when the spool on the right-hand side of the machine is full the drive is transferred to the left and vice versa. Thus a ribbon fitted to a machine will continually travel to and fro while the machine is being operated. The ribbon guide rises each time a key is struck and on the typebar resuming its rest position, falls back so that the letter is immediately visible. Most machines now are fitted with a half-inch ribbon, and by means of a three position switch it is possible to type in one of two colours. The third position, stencil, as its name implies, is used when cutting stencils for reproduction work. When the switch is in this position the type strikes directly on to the stencil material so destroying its ink insulating properties and allowing ink to pass through when the stencil is fitted to the duplicator. In some cases the ribbon drive is out of gear when the stencil switch is used; this makes for more even wear and consequently gives the ribbon a longer life.

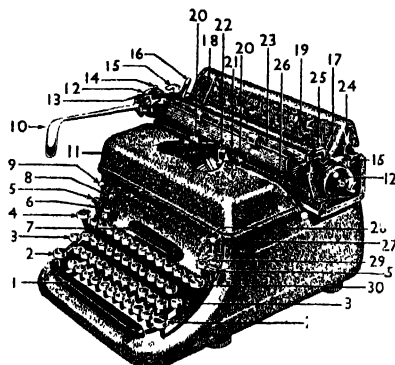
The letters on the keyboard are not arranged alphabetically, but an arbitrary grouping has been adopted whereby the letters most used are in the middle and therefore directly under the fingers. The

one now generally adopted for Eng. machines is as follows:—

q w e r t y u i o p  
a s d f g h j k l  
z x c v b n m

Continental keyboards follow this arrangement with one or two changes of position. The numerals, punctuation marks, fractions, etc., vary slightly on different makes, although the tendency is now to standardise keyboards.

The earliest machines had only one set of type, capitals. Later models were fitted with another set of bars carrying the small letters; this necessitated of course a double keyboard making a very unwieldy instrument. These were succeeded by the shift key T, where two or three characters are fitted to each bar and the shift mechanism moves the carriage in order to bring the paper into the correct relation with the letter required. A more modern design is the segment shift. In this case the type bar segment moves up and down instead of the carriage. The advantage is that the carriage is rigidly attached to the machine and in consequence fewer links and connections are required; this arrangement also makes possible the interchangeable carriage which is a feature of some machine.



Remington Rand, Ltd

#### TYPEWRITER

**Operating Parts**—1, Space bar; 2, shift keys (left and right); 3, shut lock (left and right); 4, back space key; 5, keyboard margin control (left and right); 6, tabulator clear key; 7, tabulator bar; 8, ribbon reverse; 9, key release lever; 10, carriage return and line space lever; 11, snap-off top plate; 12, platen knob (right and left); 13, variable line spacer; 14, line space regulator; 15, carriage release lever (right and left); 16, ratchet detent or release lever; 17, removable platen brackets (right and left); 18, adjustable paper side guide; 19, paper centering scale; 20, card holder (right and left); 21, aligning scale; 22, type guide; 23, paper bail; 24, paper release lever; 25, paper bail release; 26, carriage scale; 27, ribbon indicator; 28, personal touch regulator; 29, tabulator set key; 30, margin release key.

The general design of the T. seems to be fairly settled but small improvements are constantly being made. All standard office machines are fitted with a variable line spacer, which consists of a clutch inside the platen ratchet wheel. This is released by pressure on a boss protruding from the platen knob and enables the platen to be turned independent of the ratchet, thus making it a simple matter to write exactly on lines. Tabulators increase the speed of operation when it is necessary to arrange work in columns for accountancy and general statistical purposes. Another development in Ts, is the all-electric T. In this machine all functions are controlled from the keyboard. The carriage returns and is turned up the required number of spaces by the pressing of a key. The shift (which is of the basket type) as well as the type bars is mechanically assisted. The keys are pressed, rather than struck by the finger, the key dip being only about one eighth of an inch, from which point the bar is assisted up through the guide and on to the paper. Generally this is done by means of a rubber covered roller situated underneath the machine. When the power is switched on this constantly revolves and the action on depressing a key is to bring a serrated cam in contact with it. The roller flicks the cam over which in turn brings the type bar up. The impression may be varied by altering the speed of the motor and consequently the driving roller.

Ts are also modified for any language, special arrangements having to be made in the design for those whose characters are written from right to left, for typing accents by means of dead keys, etc. Even Chinese has been attempted; an electric T, with 5400 ideographic type faces has been developed in America, on which a speed of 40 to 45 Chinese words per minute can be attained, the characters being arranged on a cylinder in three groups according to frequency of use, and the machine being operated by a keyboard with 43 keys. See R. T. Gould, *The Story of the Typewriter: from the Eighteenth to the Twentieth Centuries*, 1949; and M. Crooks and F. Dawson, *Dictionary of Typewriting*, 1949.

**Typha**, genus of aquatic plants (family Typhaceae), with sword-shaped leaves and long cylindrical brown spikes of female flowers, surmounted by a slender deciduous spike of male flowers. *T. latifolia*, great reed mace, cat's-tail, or 'bulrush', is a large and handsome plant, the down of which was formerly used in stuffing pillows and mattresses.

**Typhoid Fever**, see ENTERIC FEVER.

**Typphon**, or Typhoeus, in Gk. mythology, was a monster with a hundred heads who was subdued by Zeus and buried in Tartarus under Mt. Aetna, the workshop of Hephaestus. According to Homer, he was concealed in the earth in the country of the Arimi, which was lashed by Zeus with flashes of lightning. T. was the youngest son of Tartarus and Gaea, and by Echidna became the father of the dog Orthus, Cerberus, the Lernean hydra,

Chimera, and the Sphinx. He also begot the dangerous winds, and is sometimes called the father of the Harpies.

**Typhoon, Hawker**, single-seater, low wing, cantilever, land monoplane with retractable undercarriage and tail-wheel designed primarily for both day and night fighting duties. Made by the Hawker and Sopwith companies, it was powered by a Napier Sabre liquid-cooled engine which, with its 2200 h.p., concentrated into a small space more power than that developed by an express locomotive. It had two alternative types of armament, consisting either of twelve .303 Browning machine-guns or of four 20 m.m. Hispano guns. The twelve-gun type was known as the Typhoon Mk. IA and the other as the Typhoon Mk. IB. On the wings were racks for bombs or rockets, and the rocket-firing T. was most successfully used as a tank destroyer during the 1941-5 fighting in Europe. The first official mention of the T. came after the Dieppe raid (q.v.) in August, 1942. Apart from its successes in air combat, the T.'s terrific fire-power was used with great effect against ground and sea targets. It was used with notable effect in the conflict for Avranches and Mortain in the battle of Normandy (1944).

**Typhoons**, name of Chinese origin, meaning 'great wind,' now restricted to tropical revolving storms in the China Seas. They are essentially the same as the cyclones in the Indian Ocean or W. Indian hurricanes, and are formed in low lat., at all times of the year but mainly in the late summer and early autumn; they move north-westwards, curving N., and finally move away north-eastwards before dissipating among the westerly disturbances. Although they move comparatively slowly the winds circulating round are very high, indeed a speed of 134 kilometers per hr. was recorded at Guam during a T. in March 1923, with a barometric reading no lower than 987 millibars (mb.). The lowest pressure ever recorded at sea level, 887 mb., was the centre of a T. in the Pacific Ocean on Aug. 18, 1927. Ts. are notable for the patch of clear blue sky in the central calm area, which is nevertheless dangerous to sailing vessels; these are unable to keep way in the midst of great waves, and may be struck again at any moment from any direction as the storm travels on. The rapid fall of the barometer gives short warning of approach, but the navigator may be sure in his calculation of wind direction and find the safest path. To sailing vessels Ts. are very dangerous, but modern steamers can negotiate all but the most severe. They can be of sufficient violence to give rise to 'tidal waves,' which are destructive to ports and shipping.

**Typhus Fever** (Gk. *τύφος*, mist or stupor), or **Jail Fever**, acute contagious disease, characterised by a high fever, severe nervous symptoms, and a peculiar rash. Complete agreement does not yet exist as to the microbiology of T., but the causal agent is probably a dumb-bell-shaped virus-like organism known

as the *Rickettsia prowazeki*, so called, after the names of the investigators who lost their lives in the study of the disease, by Da Rocha Lima who also conducted researches. T. has been known in Europe since the eleventh century. The conditions predisposing to it are bad sanitation, overcrowding, starvation, etc. The disease is most frequent in war time, especially among prisoners and refugees and in invaded territories, as was exemplified during the First World War in Serbia, Rumania, and Poland, and during the occupation of Italy at the end of the Second World War. T. is chiefly confined to cold and temperate climates, notably Russia, Poland, and N. Africa. This incidence is not referable to mere cold but to the overcrowding endemic in those countries, and the defective ventilation, coupled with the greater possibilities for dissemination by infected lice. It is, indeed, a lice- or flea-borne disease, or, as some say, it is transmitted by the louse and by the louse only. It is most frequent and characteristic in adults but children are by no means exempt, though it usually assumes with them a milder form. The mortality has been estimated at about 18 per cent of cases, but the rate varies greatly according to whether the means of proper treatment are or are not available. The period of incubation is usually from seven to ten days, during which only a slight general debility is observed. The fever is ushered in with rigors, after which the temperature rises to 103° or 105°, attaining a maximum about the seventh day, when it remains steady or gradually becomes lower. The tongue is first of all coated with a white fur, which afterwards becomes yellow or brown. The teeth are coated with sordes. There is usually a degree of constipation and the urine is scanty. At the fourth or fifth day the characteristic eruption appears. This consists of spots or blotches of rose colour, appearing chiefly on the abdomen and flanks; they are for the most part petechial in character, that is, they consist of subcutaneous effusions of blood. The patient is very feeble and generally in a state of wakeful stupor, starting with contracted pupils and diminished capacity for perception. The crisis occurs about the fourteenth day and if favourable is marked by a fall in temp., free perspiration, and amelioration of the distressing symptoms. The chief points involved in the treatment of T. F. are good nursing, fresh air, and a milk diet. Destruction of lice by 'D.D.T.' insecticide controlled the It. epidemic previously mentioned. See S. B. Wolbach, and others, *The Etiology and Pathology of Typhus*, 1922; J. D. Rolleston, art. 'Typhus Fever' in *Dictionary of Practical Medicine* (ed. Sir M. Morris), 1927; H. Zinsser, *Rats, Lice, and History*, 1942.

**Typography**. The term formerly embraced the whole craft of printing, but is to-day customarily used in the narrower sense to signify type designing. The quality of T., both in the design of the typefaces themselves and in their layout had declined in the second half of the

nineteenth century, and William Morris, drawing on Renaissance sources, reaffirmed the principles of good book T. that are alive to-day.

The essence of typographic design is fitness to purpose, and T. which hinders the reader's understanding of the printed message is bad. In advertising, choice and arrangement of typefaces can suggest the quality of the advertised product, or simply draw attention to it as forcefully as possible. The typography of books serves other needs. Fiction, poetry, books of reference, and children's literature are some of the more important categories which have their individual problems calling for different treatment, the first aim being readability in its widest sense. Book T. should not obtrude itself on the reader. Its basic principles are strongly traditional, and the designers' scope for initiative lies more in the title page and other preliminary matter rather than in the treatment of text pages. The policy of the manufacturers of modern type-setting equipment in reviving the best typefaces cut by printers of the past has been a major contribution to good typography to-day.

See T. B. Updike, *Printing Types, Their History, Forms, and Use*, 1937; S. Morison, *Four Centuries of Fine Printing*, 1925, and *The Typographic Arts*, 1949.

**Tyr**, in Norse mythology, a son of Odin, and god of war. His right hand is sacrificed in the struggle with the monster Fenriswolf, the son of Loke, in the great battle between the good and evil principles. He succeeds in slaying Garm, the terrible hound of the Gnipa cave, but receives his death-wound in the conflict. From his name is derived the word 'Tuesday,' through the A.-S. *Tiwes dæg*. Tyr's day.

**Tyrant** (Gk. *Týparras*), name given by the anc. Gks. to a man who availed himself of the discontent of a people to win popularity and then to overthrow the existing gov. and possess himself of the sole authority. Where a T. did not abuse his power, the people often fared better under a 'benevolent despot,' while a tyranny often encouraged new developments in the State. Such tyrannies arose most commonly in the seventh and sixth centuries B.C., and many of the Ts of this time have earned a high reputation by the impetus they gave to trade and commerce, and by their encouragement of the arts. The dislike of monarchs in general, however, led men to associate the name of T. with the idea of a cruel and arbitrary ruler, and its modern meaning is also largely due to the ultra-constitutionalists of the fourth century in Athens, to whom the democracy of Pericles was the ideal of gov.

**Tyras**, see DNIESTER.

**Tyrconnel, Richard Talbot**, Earl of (1630-91), Irish Catholic soldier and administrator, b. in Ireland. In 1687 he was made lord-deputy of Ireland. He fought hard against the Protestant ascendancy, and when William III. raised the siege of Limerick T. fled to France, to return in 1691 with small authority.

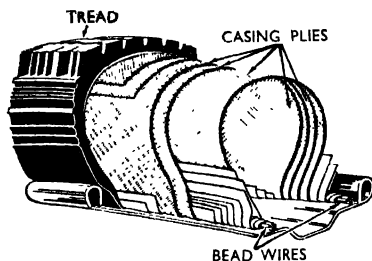
**Tyre** (modern **Sur**), anct. tn. of Syria, built partly on an is. and partly on the mainland and said to have been founded in the fifteenth century B.C. It was the prin. seaport of the Phoenicians, and as such known to the Gks. It was originally a colony of Sidon, divided between the mainland and the is., which were linked by a causeway. As an is. fortress T. withstood many sieges, but was sacked by Alexander in 332 B.C. and did not recover. It was, however, a flourishing port under the early Rom. emperors, and a place of considerable importance in medieval history, especially as the stronghold of the Crusaders (1124-1291). But after the fall of Acre the Christians deserted the city, which was then destroyed by the Moslems. In Rom. times, it was famous for its silk and purple dye. The modern city is now a seaport in the Lebanese Republic. Pop. 6000.

**Tyres**, see **TIRRE**.

**Tyres** (Rubber), are fitted to the wheels of road vehicles and aeroplanes to absorb shocks and enable the vehicle to be steered. At one time solid rubber T. were fitted to many road vehicles, but are now almost obsolete. The pneumatic tyre was first invented by R. W. Thomson, a Scotsman, in 1845. His tyre was fitted experimentally to the horse-drawn carriages of his day, but achieved little commercial success. In 1888 J. B. Dunlop, a Scotsman, practising as a veterinary surgeon in Belfast, reinvented the pneumatic tyre. He used it to equip bicycles, where it was very successful in reducing the effort needed to propel these machines along the road. The virtues of the pneumatic tyre gave a great impetus to the pastime of cycling, and led to cycle tyre manuf. on a large scale. The successful development of the motor-car was made possible by the manuf. of pneumatic car T., first made in 1895 by the Michelin Company in France. Pneumatic T. for aeroplanes were first made in 1910 by the Dunlop Company, for heavy commercial vehicles in 1917, and for agric. tractors in 1932, both by Amer. companies.

The basis of the pneumatic tyre is an impermeable flexible container for air under pressure. This container is restrained from bursting by a non-extensible casing made from rubberised textile material. In its turn, the casing is protected from wear by a layer of rubber specially designed to resist abrasion, usually having a patterned surface. The pneumatic tyre as normally supplied, consists of two parts, a rubber inner tube fitted with an inflating valve, and an outer cover of composite construction. The first outer covers for mechanically propelled vehicles were made from layers of square woven canvas stuck together with rubber material. These soon failed in service, due to the threads chafing against each other where they crossed. The use of a parallel 'cord' construction, in which each textile cord is separated from its neighbour by a film of rubber, brought about a great increase in tyre life. Covers are now made with many layers of this

rubberised cord material, built up so that the cords of each layer (or 'ply') cross those of the plies above or below at an angle of about 45°. This gives strength in each direction. Another important milestone in the manuf. of pneumatic T. was the discovery that the addition of carbon black to the rubber compound of the outer cover, considerably increased its resistance to wear. Carbon black was first used in pneumatic tyre treads in 1904 by S. C. Mote, an Englishman. Amer. workers followed this up by discovering that a special form of carbon black, made by burning natural gas, produced an even greater resistance to wear. This peculiar effect of carbon black upon rubber is



Dunlop Rubber Co., Ltd.

#### STEP DOWN DIAGRAM OF CAR TYRE

known as 'reinforcement.' A very important part of the pneumatic tyre is the 'bead' construction of the outer cover, which serves to hold it on to the rim of the wheel. J. B. Dunlop's early T. of 1888 were wrapped on to the rim with a bandage of canvas. In 1890 C. K. Welch invented a cover with a completely inextensible edge, usually made by moulding steel wires into this portion. Later in the same year, W. E. Bartlett invented a cover with a thickened up extensible edge, usually moulded in hook form to lock into a corresponding hook in the rim. The former process is the one used in pneumatic T. to-day.

The first pneumatic T. on motor-vehicles seldom lasted more than two or three thousand m., but the successive developments of cord construction, reinforcement with carbon black, and steel wire beads (together with many other achievements) has resulted in the motorist of to-day expecting a mileage many times greater as a matter of course and thus in spite of the fact that the performance of modern cars is vastly greater than those on the road in the early days of motoring.

Ingenious as the construction of the pneumatic tyre may be, it is useful to remember that it only serves as a bag to retain air. It is the air which mainly carries the load of the vehicle and cushions it against road shocks. Maintenance of the correct air pressure largely determines the cushioning effect obtainable. Air pressure is also of considerable importance in relation to tyre life. Tyre design is a

compromise between many opposing factors, the final result being appropriate to the conditions of service involved, and only obtainable if the correct air pressure is used.

**Tyrol, or Tirol**, most westerly prov. of Austria, bounded on the N. by Bavaria, on the S. by Italy and Switzerland, on the W. and E. by the provs. of Vorarlberg and Salzburg respectively. Area 4884 sq. m., but prior to its partition under the treaty of St. Germain the area was over 10,000 sq. m. It is traversed from W. to E. by the main chain of the Alps, but the loftiest peak, **Ortler Spitz** (12,802 ft.), lies in It. ter. The other groups of mts. are the **Oetzthaler Alps** (also partly in It. T.), **Stubai**, and **Ziller Thal Alps**, which connect the **Rhethian Alps** of Switzerland with the **Höhe Tauern** in the E. of the T., where they attain their culminating point, **Gross-Glockner** (12,455 ft.), on the frontiers of T., Salzburg, and Styria, and separate the valley of the **Inn** in the N. from the valleys of the **Drave** and **Adige** in the S. Besides the rivs. already mentioned, the N.W. is watered by the **Ill** and **Bregenz**, flowing into **Lake Constance**, which forms the N.W. boundary. The climate is severe in the uplands, but in the narrow valleys of the S. is warm and similar to that of Lombardy. T. is above all a pastoral land, the cattle, as in other Alpine lands, being the mainstay of the peasants; but forestry also employs a certain proportion of the pop. There are lead-mines at **Landeck**, and the saltworks of **Halle**, near **Innsbruck**, are famous. There are also factories for preserved fruits and tobacco. The cap. is **Innsbruck**.

T. was in Rom. times inhabited by the **Rhaetians**. It passed into the possession of the **House of Hapsburg** in the fourteenth century. The S. T., a purely Austrian prov., was transferred from a defeated Austria to a victorious Italy in 1919 and the inhab. were ruthlessly Italianised during some twenty years of Fascist domination. (For the hist. of this question, see under **AUSTRIA-HUNGARY**.) After the Second World War, when Austria was occupied by the **Allies**, the prov. of T. (together with **Vorarlberg**), was assigned to the W. or **Fr. Zone**, with the exception of **Ost-Tirol**, which was included in the **Brit. Zone**. The new agreement made by the **Paris conference** in 1946, if it did not give the **Tyrolese** reversion to **Austrian** sovereignty gave them almost everything else. The prov. is to be autonomous, Ger. will be recognised as an official language equally with It., there will be **Austrian** officials and **Austrian** schools, the pop. deported by **Mussolini** will be encouraged to return, and customs barriers between the S. T. and Austria will be largely removed. Pop. 433,700.

**Tyrone**, **Hugh O'Neill**, Earl of (c. 1540-1616), Irish rebel, frequently engaged in intrigues against **Elizabeth**. He eventually promised submission, but was afterwards regarded with suspicion and forced to flee in 1607, dying at **Rome**. His nephew, **Owen Roe O'Neill** (c. 1590-1649),

fought in Ireland in 1642, being chosen general by the Ulstermen, and was successful against the Eng. and Scots.

**Tyrone**, co. in the prov. of Ulster, N. Ireland, bounded W. by Donegal, S. by Monaghan and Fermanagh, E. by Lough Neagh and Armagh and N. by Londonderry. It is hilly in the N. and S., the prin. ridges being the Sperrin Mts. (2240 ft.) in the N.E. and the Slievebeagh (1255 ft.) in the S. It is traditionally called 'T. among the bushes' from its well-wooded valleys. The prin. rivs. are the Strule and its tribs., of which the chief is the Derg, the Blackwater which forms its S.E. boundary, and the Foyle which bounds it in the N.W. In the E. is a fertile plain, and agriculture flourishes. Oats is the chief grain crop, and potatoes, flax, and turnips are grown; a considerable area is occupied by pasture, and cattle are reared in large numbers; poultry and pigs are also kept. Sheep are raised in the valleys, and meat and eggs are exported to England. Coal is found at Coalisland, near Dungannon, but it is no longer mined. Linens and coarse woollens (including blankets), rayons, stockings, soap, candles, chemicals, earthenware, and other products of light industries are manufactured. It returns five members to the N. Ireland Parliament, and with Fermanagh returns two members to the U.K. Parliament. There are sev. interesting ruins in the co. Omagh is the co. tn., and Clogher, formerly of ecclcs. importance, has a cathedral dating from the eighteenth century. Its rivs. are famous for salmon and trout fishing. Area 1280 sq. m. Pop. 129,800. See Sean O'Faolain, *The Great O'Neil*, 1943; and *Some Ancient Monuments in State Charge* (H.M.S.O.).

**Tyrrell, George** (1861-1909), Irish divine, b. in Dublin of a Protestant family. He entered the Rom. Catholic Church and became a novice in the Society of Jesus. He was ordained a priest in 1891 but came into conflict with the Church for upholding modernism. Following an open letter he was dismissed from the Society of Jesus and suspended from the administration of the Sacraments in 1906. In Oct. 1907 he was excommunicated but received absolution on his deathbed. He formed a close friendship with Baron von Hügel in 1897 which lasted until T.'s death. His best-known writings are: *Nora et Venera* (1905); *The Faith of the Millions* (1902); *Hard Sayings* (1904); *Through Scylla and Charybdis* (1907) (wherein he evolved his idea of revelation as experience); *Mediævalism* (1908); *Christianity at the Crossroads* (1909). See his *Auto-*

*biography and Life* (arranged by M. D. Petre), 1912; A. Loisy, *Tyrrel et Henri Bremond*, 1936; and life by J. Stam, 1938.

**Tyrrell of Avon, Sir William George Tyrrell, first Baron** (1860-1947), Eng. diplomatist, son of William T., a judge of the High Court of India. Educated in Germany and at Balliol College, Oxford, he entered the Foreign Office in 1889, and was private secretary to Sir Edward Grey during the critical years leading up to the First World War. In 1925 he was appointed permanent under secretary of state for foreign affairs and was one of the ablest members of the Foreign Office and diplomatic service of his time. In 1935 he was appointed President of the Brit. Board of Film Censors. He was raised to the peerage in 1929.

**Tyrrhenian Sea** (anc. *Tyrrhenum Mare*), that part of the Mediterranean Sea between Italy and the is. of Corsica, Sardinia, and Sicily.

**Tyrtæus**, Gk. poet of the seventh century B.C. According to legend, the Spartans on the outbreak of war with the Messenians sought counsel of the Delphic Oracle, and were told by Apollo that, would they win, they must send to Athens for a leader. Appealed to, the Athenians dared not disobey the god, so gave their rivals the Spartans a lame schoolmaster, as the least likely to help them. But when Tyrtæus thus reached Sparta, his rousing speeches and warlike songs so inspired one and all that the Messenians were totally defeated. To this day 'Tyrtæan Ode' remains proverbial. See G. G. A. Murray, *Ancient Greek Literature*, 1897.

**Tyrwhitt, Thomas** (1730-86), Eng. classical commentator, b. in London. He was master of both Eng. and classical literature, and pub. eds. and emendations of classical authors, including: *Aristotelis de Poetica Liber, Græce et Latine* (1794); *De Lapidibus* (1781); *Observations and Conjectures upon some passages of Shakespeare* (1766); *The Canterbury Tales of Chaucer* (1775); and *Poems supposed to have been written at Bristol by Thomas Rowley and others in the Fifteenth Century* (1777) which was the chief work exposing the Rowley forgeries as the work of Chatterton.

**Tzana**, see DEMBEA.

**Tzar**, see TSAR.

**Tzetzes, Johannes** (c. 1120-83), Gk. author, wrote commentaries on Homer, Hesiod, and Aristophanes, besides *Iliaca*, a poem concerned with the story of Troy, and *Chiliades*, a collection of mythical and legendary tales.



**U**, twenty-first letter of the Eng. alphabet, and the last of the five vowel sounds, is intimately connected with *v* and *w*. In the North-Semitic alphabet, which, as all Semitic alphabets, was purely consonantal, there was a letter *w* (*aw*), occupying the sixth place in the alphabet. When the Gks. took over the Semitic alphabet, one form of the *waw* became the Gk. *digamma* (see under **F**), while another form of it was taken into use as the vowel *upilon* and placed at the end of the Gk. alphabet, following *tau*. In the Etruscan alphabet, which was a descendant of the Gk. and the ancestor of the Lat. alphabet (see under **ALPHABET**), the vowel *u* was written *V*. Also the Romans wrote *V*, which had the value either of the vocalic *u* or the consonantal *v*. In the early Middle Ages both the forms *V* and *U* were used indifferently for both the consonantal and the vowel sound, the sign *U* being used in hands current at this time. In the late Middle Ages *U* was mainly employed for the vowel *u*, but it still was interchangeable with *v* until the spelling settled down at the end of the seventeenth century. The original sound of M.E. short *u* is preserved in such words as *put* and *pull*, while provincial pronunciation retains it more widely. For the pronunciation of *u* the breath passage is wider than for that of any other vowel, and hence its tone is low and vibrant. In chemistry, *U* is the symbol for one atom of uranium.

**Ubangi-Shari**, ter., of Fr. Equatorial Africa, lying to the N. of the Middle Congo. It includes all the regions drained by the right-hand affluents of the middle Ubangi and also by its affluent, the M'Bomou, all of which affluents form the frontier with the Belgian Congo. It also comprises the basin of the Haut-Shari, trib. of the Tchad. U.-S. is a succession of grassy plateaux cut with belts of forest which mark the valleys of numerous water-courses. The cap. and chief centre of trade is Bangui (or Bangi), on the Ubangi, linked by regular steam-boat service with Brazzaville. There are over 300 m. of roads suitable for motor traffic in the colony. The products include palm kernels and palm oil, ivory, rubber, coffee, cocoa, ginger, sugar-cane, and rice. The ter. is administered by a governor under the governor-general of Fr. Equatorial Africa. Area about 240,000 sq. m. Pop. (Africans) 1,063,000 (European) 1600.

**U-Boat**, see under **SUBMARINE**.

**Uccello**, or **Ucillo** (c. 1397-1475), name given to the painter and sculptor, Paolo di Dono, from his love of painting birds. He was b. in Florence, and is famous for his love of perspective. His 'Rout of San Romano' (1432) is in the National Gallery, London.

**Uckfield**, mkt. tn. and par., Sussex, England, on the R. Ouse, 8 m. N.E. of Lewes. It has an agric. college. Pop. 49,000.

**Udaipur**, **Oodeypore**, **Odeypoor**, or **Meywar**, state and cap. of Rajasthan, India. State area 13,170 sq. m.; pop. 1,926,700. The cap., Udaipur, is situated on Lake Pichola. Pop. 59,700.

**Udal**, see **ALLODIUM**.

**Udall**, **Nicholas** (1506-1556), Eng. dramatist and scholar, b. in Hampshire, and educated at Corpus Christi College, Oxford. From 1531 to 1541 he was headmaster of Eton, and in 1554 became headmaster of Westminster. He is best remembered for his *Italian Boisterous* (1552), the first Eng. comedy, an unpolished but lively piece, of which there are sev. eds. including that by W. H. Williams and P. A. Robin (Temple Dramatists, 1901).

**Uddevalla**, seaport tn. of Göteborg, Sweden. It has shipbuilding, wool and textile industries, wood-pulp mills, and sugar refineries. Pop. 21,400.

**Udet**, **Ernst** (1896-1941), Ger. airman, b. at Frankfurt on Main. In the First World War he was Germany's most famous air ace, with a record of sixty-two air victories. Later he took a major part in the development of the Luftwaffe.

**Udine**: 1. Prov. of Italy, in Venetia, between the Caric Alps and the gulf of Venice, watered by the R. Tagliamento and its trib. The major part consists of the fertile Friuli plain; wine, hides, flax, silk, and hemp are produced. Area 2536 sq. m. Pop. 810,200. 2. Cap. of the above, 60 m. N.E. of Venice. It contains an old castle, once the residence of the patriarchs of Aquileia and now a prison; a cathedral, containing fine sculptures and paintings. It manufs. silk and leather goods. In the battles of 1945 many churches were severely damaged. Pop. 70,400.

**Udmart** (formerly **Votyak**). Autonomous Republic of the R.S.F.S.R., in the foothills of the W. Urals. Almost half the area is forest land, with large swamps. Rye and oats are grown, and there are deposits of copper, iron, slate, peat, and building stone. The cap. is Ishovsk. Area 15,019 sq. m. Pop. 1,220,000.

**Ued**, see under **LOYALTY ISLANDS**.

**Ufa**, cap. of the Bashkir A.S.S.R., at the confluence of the Ufa R., and the Belan. A considerable trade is carried on in corn and cattle, and there are iron and copper-smelting works, breweries, saw-mills, and corn-mills. Pop. 250,000.

**Uffington White Horse**, see under **WHITE HORSES AND HILL FIGURES**.

**Uganda**, Brit. Protectorate in E. Africa, mostly within the basin of the Upper

Nile, extending from 1° S. lat. to the N. limits of the navigable waters of the Albert Nile at Nimule. It is surrounded by the Anglo-Egyptian Sudan, Kenya, Tanganyika, Ruanda-Urundi, and the Belgian Congo. The E. boundary runs from Mt. Zulia on the Sudan border along the Turkana Escarpment to Mt. Elgon (14,140 ft.) and thence follows the Malawa and Sio Rs. to the N.E. waters of Lake Victoria. On the W. side are the Nile-Congo watershed, Lake Albert, the K. Semliki, the Ruwenzori Mts. (16,800 ft.), and Lake Edward. The area of U. is 93,981 sq. m., of which 13,680 sq. m. are water. The extreme distance from E. to W. is 350 m., from S. to N. 400 m. The Protectorate forms part of the central African tableland, the greater part having

dry Ankole and Masaka grasslands, with a relatively low rainfall; (iv) the W. rift valley. This is only thinly populated. The valley is occupied by a series of lakes and rivers, Lakes Edward, George, and Albert; the Albert Nile and the Semliki R.; (v) the Karamoja region, a land of small ann. rainfall and devoid of permanent rivs. Deep wells provide water in the dry season. It carries a meagre pop. of semi-nomadic pastoralists; (vi) the plateau of tree savanna which has a sufficient rainfall for agriculture on a large scale. Its chief feature is the Victoria Nile with its associated labyrinth of shallow waterways. There are many shallow lakes. The Kagera R., headwater of the Nile, touches the Protectorate's S. boundary. For the most part, however, the many



E.N.A.

#### UGANDA: THE WATERFRONT AT ENTEBBE, LAKE VICTORIA

an altitude between 3500 ft. and 4500 ft. above sea level.

*Physical features and climate.*—U.'s continental situation and its character as an inland plateau of very varying altitudes account for its climatic regions, and its general elevation explains the absence of the more enervating conditions usually associated with equatorial coastlands. Climatically U. may be divided into a number of distinct zones which, however, merge gradually at their borders: (i) the mt. and hill zones, in which the vegetation varies with altitude. Above 14,200 ft. there is perpetual snow, and the descent from these mts. lies through stretches of alpine meadow, bamboo, forest and bracken, and savanna. Then gradually upland conditions prevail, like those of the general plateau level. The chief peaks (besides Mt. Elgon) are the three volcanoes of the Mufumbiro Mts.; (ii) the wet N. and W. margins of Lake Victoria, with an average rainfall of 50 in. In this region is the Mabira Forest (120 sq. m.); (iii) the

rivs. of the U. plateau are sluggish vegetation-covered swamps; such are the Mpologoma, Sezibwa, and Kafu. Only in hill regions and on the slopes to the W. rift valley are clear running streams commonly found.

*Population and Races.*—Three racial groups, Bantu, Hamitic, and Nilotic, comprise the African pop. of U., the Bantu constituting three-quarters of the total. They occupy the S. and E. portion of U., excepting the Teso country in the E. Prov. and some areas along the Kenya border. The Hamitic group (approximately 300,000) is represented by the Teso and by isolated units along the Kenya boundary. The N. and W. part is the home of the Nilotic tribes. The estimated number of Africans in U. (1948) is approximately 4,000,000. The European pop. is 3600 and the Asian 37,500.

*Production and Commerce.*—U. is essentially an agric. country, and, except for the Karamojong in the N.E. and the

Bahima in the grasslands of the S.W., who live chiefly by cattle-raising and trading, the pop. is almost entirely engaged as peasant proprietors in the cultivation of the soil. There is, however, a demand for labour by non-native and African employers, mainly in Buganda and the E. Prov., in the cultivation of economic crops and in the seasonal occupation of cotton ginning. The mining areas of Ankole in the W. Prov. and the timber workings and sisal estates in Bunyoro also absorb a large amount of labour. Central U. is a densely populated country, fertile and capable of producing a large variety of crops, chiefly cotton, coffee, sugar, tobacco, rubber, tea, and a little pyrethrum. The prin. native food crops are plantains, millet, and sweet potatoes; maize, rice, sugar-cane, chihes, yams, groundnuts, sim-sim (sesame), and a little wheat are grown. There are some non-native estates, those owned by Europeans being engaged in the production of coffee, rubber, and tea, while sugar and sisal estates are in the hands of Asians. Nearly 200 cotton ginneries, 2 sugar factories, and a distilling factory for the mannif. of power alcohol have been estab.; there are tobacco factories at Kampala and Jinja, and coffee-curing factories at Kampala, Masaka, and Bubulu. There are indications that a wide range of minerals exist, including gold, tin, tungsten, petrol, wolfram, tantalite, bismuth, and mica. There are large deposits of salt in the Katwe and Kasenvi crater lakes.

In 1948 the Customs Depts. of U. Protectorate, Kenya Colony and Protectorate, and Tanganyika Territory were amalgamated as the E. African Customs and Excise Dept. Since Kenya and U. now constitute a single unit for the purposes of customs, virtual freedom of trade exists between the two ters. To a considerable extent the external trade of each is operated through common mercantile and transportation services, and the great bulk of both import and export business is handled at Mombasa, which functions as the main collecting and distributing centre of E. African trade. The following figures represent the landed values at Mombasa in the case of imports and the 'f.o.b. Mombasa' value of exports. The total value of retained imports (excluding specie) into U. for 1946 amounted to £5,157,773. India supplied 47 per cent of the total cotton textiles trade for Kenya and U. combined; the U.S.A. supplied 29 per cent, and the U.K. 14 per cent. The total value of domestic exports was £9,657,026 (over double the figure for 1938). The main items of export are cotton, cotton seed, coffee, hides and skins, sugar, cigarettes, chillies, and fish.

**Constitution and Administration.**—Constitutional changes, the main feature of which was a provision for the election to the Legislative Council of two Africans from each of the four provs. of U., including the kingdom of Buganda, were made in 1950. The Legislative Council now consists of sixteen official and sixteen unofficial members, besides the governor as president.

The Protectorate is divided into four provs. Buganda is on a different footing from the remainder. In Buganda all chiefs are appointed by the kabaka (king) with the approval of the governor, and the kabaka and lukiko (native council) with the governor's consent, have the power to make laws binding upon all natives in Buganda. In the other provs. native administrations are recognised in stages of development varying with the advancement of the tribes. There are native rulers in Ankole, Toro, and Bunyoro, each with his appointed Prime Minister and council.

**Religion and Education.**—The Protestant and R.C. churches have been working in U. for 70 years and now have one and a quarter million adherents between them. (*See also under History.*) There are also sev. hundreds of thousands of Moslems. The remainder of the pop. is pagan, though the desire for education brings many more into the orbit of the missions each year. Education is still mainly in the hands of the missionary societies who receive grants from the gov., but since 1925 the societies' work has been supplemented by a gov. educational scheme. The total number attending schools (1947) approaches 267,100. Makerere College, Kampala, is an E. African institute for higher education, approaching univ. status.

**Communications.**—The main line of the Kenya and U. Railway extends to Kampala. There is a railway from Port Bell to Kampala, 7½ m. long. There is a lake steamer service connecting Entebbe, Port Bell (Kampala), with Kisumu and the other ports on Lake Victoria. There are 2200 m. of all-weather roads under the public works dept., and about 5300 m. of other motorable roads maintained by the native administrations. There are sev. airfields and seaplane facilities.

**History.**—In 1862 Speke and Grant were the first Europeans to reach the cap. of Mutesa, king of Buganda, near the present Kampala. In 1872 Baker, governor-general of Equatoria, moved S. and advanced to Masindi, the headquarters of the young king of Bunyoro, Kabarega, and proclaimed the formal annexation of Bunyoro on May 14, 1872, but friction ensued culminating in the battle of Masindi on June 8. Baker then retreated to Fatiko. Stanley visited U. in 1875, the first Eng. Protestant missionaries arrived in 1877, and in 1879 came Fr. Rom, Catholics. Christianity made headway up to the time of Mutesa's death in 1884, but his son, Mwanga, proved unfavourable to it, persecuting and even massacring the missionaries' adherents. His people, however, turned on him and he fled to the S. of Lake Victoria; but the Arab traders and native Mohammedans then acquired control, so that the missionaries and native Christians were also driven out. In the same year control of the Brit. sphere in E. Africa had been assigned by Royal Charter to the Imperial Brit. E. Africa Company, and when the Anglo-Ger. Agreement of 1890

confirmed the inclusion in the Brit. sphere of present day Kenya and U. Captain (later Lord) Lugard (*q.v.*) was sent to establish the Company's influence in U. He found Mwanga restored with the help of his fugitive Christian subjects, and made a treaty with him, whereby the Company acquired a right to intervene in the internal affairs of his kingdom and assumed the responsibility for the maintenance of order.

The different religious groups were, however, intensely hostile to one another, and war broke out in Jan. 1892 between the Protestant and Rom. Catholic factions. The latter were defeated, and fled, taking Mwanga with them. Peace was concluded and Mwanga restored in March. Meanwhile the Company, crippled by the cost of occupation, gave notice of its intention to evacuate U., and Sir Gerald Portal was sent out as Imperial Commissioner to make proposals for future governance. On April 1, 1893, he assumed on behalf of the Brit. gov. the responsibilities of the Company in Buganda. The formal estab. of a protectorate over Mwanga's kingdom was postponed until 18 June, 1894. In the meantime Bunyoro Prov. was conquered and its ruler, Kabarega, driven out. In 1896 the protectorate was extended to most of the other regions which are now included within the present U. and this term was thereafter applied to the whole ter.. Mwanga's kingdom, which is the Buganda Prov. of to-day, being referred to as Buganda.

In the years following 1894 there was little development of the Brit. administration, whose resources were quite inadequate for the gov. of a vast ter. which extended as far E. as Naivasha. In July 1897, however, certain chiefs in Buganda were plotting a revolt, and on 14 Aug. 1897, Mwanga's infant son, Daudi Chwa, was proclaimed king with a regency of three leading chiefs. A few months later the very existence of the protectorate was threatened by a mutiny of the Sudanese troops. The heavy and unproductive expenditure in U. led the home gov. to reorganise the administration. This was done under Sir Harry Johnston, who went out as special commissioner at the end of 1899. The affairs of Buganda were settled by the U. Agreement, 1900, and the foundations were laid of the present administrative system. The construction of the Nile Bridge in 1931 brought the railway (begun in 1896) to Kampala and provided a direct rail link between the cap. and the coast. Meanwhile a network of many hundreds of n. of all-weather roads had been built to feed the rail and lake routes. Sir Daudi Chwa, kabaka of Buganda, died in 1939 and after a period of regency of 3 years, his son, Mutesa, succeeded to the throne. Increased African participation in protectorate affairs was ensured by the addition in 1945 of 3 African members to the legislative council. Advance towards democratic forms of local gov.<sup>t</sup> institutions have been made by the estab. of partially elected vil., par., co., and dist. councils charged with pro-

moting the common welfare of the people in the areas they represent.

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**Uggero**, see OGIER LE DANOIS

**Ugione, Marco da**, see OGIONE.

**'Ugly Duchess, The,** see MARGARET OF CARINTHIA.

**Ugo Buoncompagni**, see GREGORY (popes), *Gregory XIII.*

**Ugolino della Gherardesca** (*d.* 1289), immortalised in Dante's *Inferno* as Count Ugolino, was a Neapolitan who endeavoured to usurp the gov. of Pisa, and who governed the country with great vigour. The archbishop of Pisa, Roger de' Ubaldini, formed a conspiracy against him in 1288; and attacking U. in his palace, defeated and took him prisoner. He was eventually starved to death.

**Ugolino dei Segni**, see GREGORY (popes), *Gregory IX.*

**Ugrian**, name applied to a Finno-Turki family originally found E. of the Urals. The chief branches are the Finns, the Ostiaks, the Voguls, and the Magyars.

**Uhland, Johann Ludwig** (1787-1862), Ger. poet and literary historian, b. in Tübingen. He studied law at Tübingen Univ. In 1815 a first collection of U.'s poems was pub. and various fragments followed. Three books, consisting mostly of national verses, pub. between 1815 and 1820, made him famous all over Germany and he rapidly became a political leader in the fight of the people for their anct. and often promised rights. Politics drew him away from poetry for nearly fifteen years, until 1830. There is only one book during this period, about the Ger. medieval poet, *Walter von der Vogelweide* (1822). From about 1830 he returned to poetry but his various poems were mostly ballads, romances, etc. (all of which are verse epics). There are also a few folk songs. In the revolutionary year 1848 he was a member of the Ger. National Assembly in Frankfurt-on-Main.

A collection of U.'s works was pub. by H. Fischer in 1892, and T. Hartmann ed. his diaries (1893) and his correspondence (1911-16). See lives by K. Mayer

1867, H. Fischer, 1887, A. Hartmann, 1912, H. Schneider, 1920, and A. Hub-scher, 1938. See also A. Thoma, *Uhl-lands Volksliedammlung*, 1929.

**Uhlans**, Tatar name for a particular type of soldier, and adopted in Poland to denote cavalymen employed in recon-noitring, outpost duty, etc. The name was later particularly applied to Prussian cavalry regiments armed with the lance, first formed in the eighteenth century, and used for reconnaissance.

**Uist**, two is. of the Outer Hebrides, Inverness-shire, Scotland: 1. N. U. lies 8 m. S.W. of Harris, and is separated from Skye by the Little Minch. It is 18 m. long, and from 3 to 14 m. wide, hilly in the centre and S.E., the highest peak being Mt. Baval (1138 ft.). The E. has the two sea lochs of Eport and Maddy. Most of the pop. resides in the N. and W. where there are long stretches of arable land, with good grazing. Lochmaddy is the chief vil. Pop. 3200. 2. S. U. is situated 7 m. S. of N. U., Benbecula lying between, and has a maximum length and breadth of 22 and 8 m. It is connected with Benbecula by a bridge. The prin. sea lochs, Boudale, Skipton, and Eymort, are on the E. coast and provide good trout fishing. Lochbisdale is the chief vil. Benbecula has an airport. Pop. 4800.

**Ujiji**, tn. of Tanganyika Ter., E. Africa, on the E. shore of Lake Tanganyika, 5 m. by road from Kigoma. Pop. (Native) 10,000.

**Ujvidek** (Ger. Neusatz), tn. of Hungary in the co. of Bács-Bodrog, on the Danube, the literary and religious centre of the Serbs in Hungary. Pop. 30,000.

**Ukelele** ('the jumping flea'). Hawaiian guitar, introduced to the Sandwich Islands by the Portuguese in 1877 and more recently into Europe as a popular instrument. It has four gut strings, and can be played from a notation resembling the old lute tablature.

**Ukerewe**, see VICTORIA, LAKE.

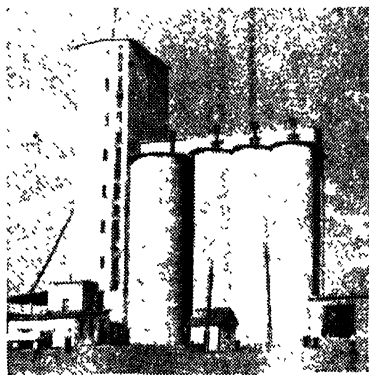
**Ukkel**, see UCCLE.

**Ukraine**, The, constituent republic of the U.S.S.R. in the S.W. To the W. lies Poland, to the S.W. the Moldavian S.S.R., Rumania, Hungary, and Czechoslovakia, and to the S. the Black Sea and the sea of Azov. At one time the U. was a part of Poland. The name was first applied to the Tatar frontiers of Poland, and later to the dist. about the middle Dnieper. In the eighteenth century the portion E. of the Dnieper passed to Russia and formed 'Little Russia.' At the second partition of Poland (1793) the W. portion also passed to Russia. For events in the U. during the First World War, see under WORLD WAR, FIRST. The U. Republic was formed after the Russian revolution of Nov. 1917 (see RUSSIA—Russian Revolution). In 1920 the U. Republic concluded a military and economic

1940, Bukovina (6000 sq. km.), ceded by Rumania, and the Khotin, Akkerman, and Izmail provs. of Bessarabia were included and, in 1945, Ruthenia (sub-Carpathian Russia) about 7000 sq. km., was also incorporated. From these new ters. two new Regions were formed, Chernovitsi (Czernowitz, Cernauti) and Izmail.

The total area in 1938 was 170,998 sq. m., in 1945 it was 223,000 sq. m. In 1939 the pop. was 38,500,000 (80 per cent Ukrainians, 9.2 per cent Russian, and 5.4 per cent Jews). In 1945 the pop. was stated to be 40,000,000. The chief tns. are Kiev, Kharkov, Odessa, Dniepropetrovsk, Stalino, and Nikolaiev. The chief tn. of N. Bukovina is Chernovitsi. The pop. of the U. belongs to a variety of Churches, the chief being the Orthodox Gk. Church and the Catholic Church.

**Physical features and Production.**—The U. enjoys a relatively mild climate, fertile black soils, and great mineral wealth. The climate of the E. U. is more continental than that of the W. In the W. the spring is earlier and autumn longer and warmer, a distribution which benefits agriculture. Precipitation decreases from N.W. to S.E., and this conduces to a change in the character of the vegetation from forest to wooded steppe. The N. forested or 'Polissia' region consists of level plains in which bogs and marshes and sandy soils prevail, and agriculture here is chiefly concerned with the breeding of dairy cattle. In the S., where the vegetation begins to change from forest to wooded steppe, sugar-beet is the most important crop. On the r. b. of the Dnieper the land rises to the Volhynia-Podolsk plateau. The climate here is milder and damper than in the Dnieper Lowland on the l.b. The



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A GRAIN ELEVATOR IN THE UKRAINE

formed the U.S.S.R. At the end of 1939 W. U. (88,000 sq. km.) was incorporated in the Ukrainian S.S.R. In

cultivation of sugar-beet, together with winter wheat on the r.b. and pig-breeding and spring wheat on the l.b. are the predominant agric. occupations. The steppe

zone of the U. is predominantly a grain-growing region. The valleys of the Donetz Heights form a separate region where the cultivators are chiefly occupied in dairy farming and orchard cultivation. In the extreme S. of the U. there is an extensive lowland area sloping gently down to the Black Sea and the Sea of Azov. Here sunflower, melons, coarse tobacco, cotton, and rice, are grown as well as the chief crop, barley. Agric. occupies a vital position in the economy of the U. Nearly 65 million ac. or three-fifths of the land area are devoted to crops, and farm work is highly mechanised. Agric. products form the basis of sev. industries; sunflower, hemp, and linseed yield vegetable oil. Cotton-weaving and jute manuf. are carried on. Flour-milling is another widespread industry, and at the riv. port of Nikolaev are the largest grain elevators in Europe.

**Minerals.**—The U. has large mineral deposits. There are considerable deposits of iron ore and coal in the Don Basin with high quality iron ore at Krivoi Rog and in the Korch Peninsula. Most of the coal and manganese ore of Russia comes from this region, while the U. is also the chief source of the European supply in the Kerch Peninsula. There are smelting and metallurgical works in the Don Basin, at Krivoi Rog, Mariupol, and Taganrog. The area of the Don Basin coal measures, from which half of the coal output of Russia is produced, is exceeded only by that of the Kuznetsk coalfield. There are also local deposits of limestones, dolomite, and fireclays, which are valuable for iron smelting processes. There is some oil production at Chernigov. Bauxite is found near Dniepropetrovsk. Salt, used in the chemical industries, is mined at Artyemovsk and Slavyansk.

**Industrial areas.**—There are three great industrial areas in the U.: (a) The Donbas, containing the tns. of Kirovgrad, Stalino, Voroshilovsk, Slavyansk, Voroshilovgrad, and others. Kramatorskaya is the centre of a large industry supplying furnace equipment and machinery for coal-mining and the metallurgical industry. In this area are locomotive-building works and chemical industries; (b) the Dnieper industrial region, with the iron and steel and engineering works of Zaporozhe, Dniepropetrovsk, and Dneprozvershinsk. Here are produced high-quality steel, tractors, ball-bearings, machine tools, agric. machinery, and the raw materials of the chemical industries; (c) the iron-mining settlements of the Volhynia-Podolsk Uplands. Here, both in Krivoi Rog and Kamenskaya, are large metallurgical undertakings and the iron and steel works of Mariupol and Taganrog. Outside these three main industrial areas but dependent on them for supplies are: Kharkov, Kiev, Kherson, Odessa, Melitopol, and Berdiansk. The significance of the U. in the Russian national economy is shown by its remarkable combination of exploited agric. and industrial wealth. No other part of Russia is better equipped with railways than the U.

**Language and Literature.**—Ukrainian, also known as Ruthenian (in ex-E. Galicia) or Little Russian or Carpatho-Russian (in the former Carpathian section of Czechoslovakia), is the language of some 35,000,000 people inhabiting the S. portion of Russia from the Carpathians in the W. to the Kuban Valley and the Caucasus in the E. Together with Russian (q.v.) and White Russian, Ukrainian belongs to the E. subdiv. of the Slavonic group and the Balto-Slavonic branch of the Indo-European languages (q.v.). It is strictly connected with Russian and White Russian (see WHITE RUSSIA); all three of them are mutually intelligible.

By the sixteenth century U. estab. Polish literary connections, and Kiev was the centre of a literature notable for its Biblical criticism and historical chronology. In the late eighteenth century U. possessed a literature all her own. One of the first and finest examples of the new Ukrainian literature is in the work of the philosophic writer and wandering preacher H. Skovaido (1722-94). The poet, I. Kotlyarevski (1769-1838), and the writer H. Khitka both wrote in a distinctively Ukrainian style, drawing much on Ukrainian folklore and legend. But U.'s finest poet was Taras Shevchenko (1814-61). The Ukrainian writer best known outside U. is N. Gogol (1809-52); Gogol wrote in Russian, but, nevertheless, his writing is strongly coloured, both in style and material, by his Ukrainian background.

**Art.**—Early Ukrainian art was strongly influenced by the Byzantine tradition, which is vividly displayed in Ukrainian building, frescoes, and icons. The central portion of the great cathedral of St. Sophia at Kiev, which was built 1017-37, shows this influence at its best. The Ukrainian baroque owed much to Polish and It. influence, and after the middle of the eighteenth century Ukrainian art joined the main stream of Russian art.

**Music.**—U. is important as the land of a rich folk music. U.'s greatest composer was Karel Szymanowski (1883-1937), but his music shows little Ukrainian influence, and he is usually regarded as a Polish artist.

For the hist. of the U. during the Second World War see EASTERN FRONT OR RUSSO-GERMAN CAMPAIGN IN THE SECOND WORLD WAR.

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Ulan Bator Hoto, see URGAA.

Ulan-Ude, cap. of the Buryat-Mongolian

A.S.S.R., S.E. of Lake Baikal, at the confluence of the Uda and Setonga rvs., on the Trans-Siberian Railway, 160 m. E. of Irkutsk. Pop. 140,000.

**Ulcer**, gradual destruction of tissue as a consequence of infection or injury. The difference between ulceration and gangrene is that, in the former the disintegrated tissues are cast off in liquid form as a discharge, while in gangrene visible portions of tissue are detached. In most cases an U. is a healing process by which diseased tissue is gradually dissolved in an 'ichor,' while the area of the sore diminishes, a scar or cicatrix taking the place of the ulcerated surface. In some cases the toxic element is too powerful for the normal healing process, and the U. tends to spread, the discharge being infectious. The best treatment is dressing with an antiseptic such as boric acid. Caustics and astringents such as silver nitrate are often useful. As ulceration is frequently accompanied by an enfeebled state of the system, the administration of a general tonic is to be recommended. Us. of the legs caused by varicose veins call for treatment of the latter condition, and skin grafting may be necessary to cover up the area of the U. Gastric and duodenal Us. are treated medically by correct diet, sedatives, rest, and alkalis; surgical treatment is by removal of part of the stomach (gastrectomy). A newer operation for such 'peptic' Us. is vagotomy, i.e. div. of the vagus nerves which control the secretion of acid. See also ROBERT ULCER; STOMACH.

**Uleinj**, see DULCIGNO.

**Uleåborg**, see OULU.

**Ulema**, collective name of the Moslem theological jurists who derive their decisions from the Koran and its commentaries. The name was especially applied to the religious hierarchy of the old Turkish Empire. The name is also given to councils of men learned in Moslem sacred law, and holding official posts. See also *SUPRISM*.

**Ulex**, important genus of Leguminosae, found in W. Europe and N. Africa. Three species occur in Britain, and are known popularly as the gorse, furze, or whin.

**Ulexite** (min.) hydrated sodium and calcium borate, occurring in fibrous rounded masses, known as 'cotton balls' in Nevada and California. It is also found in Peruvian and Chilean lake-deposits. From it are obtained borax and boric acid.

**Ullilas**, see WULFILAS.

**Ulanovsk**, cap. of the U. Region of the R.S.F.S.R., formerly known as Simbirsk. It stands on a hill on the r. b. of the Volga and is connected by railway with Moscow and Siberia. Fishing is carried on and the city is a leading centre of the food, saw mulling, and leather industries. It was the bp. of Lenin (Ulanov). Pop. 104,000.

**Ulanov**, Vladimir Ilyich, see LENIN.

**Ulixes**, see ULYSSES.

**Ullapool**, tn. of Northern Ross, Scotland, on the E. side of Loch Broom. It is the major herring fishing port of the N.W. Highland coast. Pop. 900.

**Ullswater**, James William Lowther, first Viscount (1855-1949), British politician, educated at Eton, and Trinity College, Cambridge. Called to the Bar in 1879, in 1883 he was returned to Parliament as a Conservative for Rutland. He represented the Penrith div. of Cumberland, 1886-1921. In 1905, he became Speaker of the House of Commons. He was raised to the peerage in 1921.

**Ullswater**, second largest lake in England, between Westmorland and Cumberland, 8 m. long by  $\frac{1}{2}$  m. broad and 210 ft. deep. Awa Force (80 ft.) falls on the W. side, and U. also receives the Patterdale Beck.

**Ulm**, fortress and riv. port of Württemberg-Baden, Germany, on the l. b. of the Danube, at its confluence with the Blau. It is connected by bridges with Neu-Ulm, in Bavaria. U. contains the largest Protestant church in Germany and has manufs. of hats, tobacco, pipe-bowls, machinery, instruments, and textiles. The tn. was badly damaged in the Second World War. In Oct. 1805 Napoleon defeated 60,000 Austrians under Mack, at U. Pop. 74,300.

**Ulmer Dog**, see GREAT DANE.

**Ulmus**, see ELM.

**Ulna**, inner of the two bones of the forearm, running from the wrist to the elbow. At the elbow the surface is curved, as it meets the humerus of the upper arm. The lower end articulates with the radius, or outer bone, before it reaches the wrist-bone.

**Ulnmaria Filipendula**, see DROPPWORT.

**Ulphilas**, see WULFILAS.

**Ulpian**, or Domitius Ulpianus (c. A.D. 170-228) Rom. jurist, b. at Tyre. He wrote many works, extracts from which form a large part of Justinian's *Digest*. **Ulrich von Hutten**, see HUTTEN, GILCH VON.

**Ulster**, northernmost of the four great divs. of Ireland, bounded by the Atlantic Ocean, N. Channel, Irish Sea, Leinster, and Connaught. It was one of the most anct. divs. of Ireland, and was the seat of the O'Neills. The N.E. part was for long a seat of Eng. power in the N., but until the Partition of U. in the reign of James I. no permanent settlement was made in the rest of U. Emigration has always been a drain on the pop. of the prov., which decreased from 1,914,236 in 1891 to 1,582,825 in 1901. (In 1938 the figures were: immigration 1102; emigration, 844.) Nevertheless, the prov. is prosperous, the two prin. industries next to agric. being linen and shipbuilding. In 1946 the linen industry produced goods to the value of £26,000,000. The largest single industry is agriculture, there being 96,000 farm holdings, mostly small and mostly purchased under the Land Purchase Acts. Crops are wheat, oats, barley, mixed corn, potatoes, flax, etc. Other secondary industries are rope making and tobacco manuf. U. is the only part of the U.K. in which diatomite is produced. Iron and salt are worked in Antrim, and stone and various kinds of clay for bricks, etc., in other parts. The prov. is divided into Belfast (pop. 438,100) and Londonderry

(pop. 47,800), co. bors., and the cos. of Antrim (197,300), Armagh (108,800), Down (210,700), Fermanagh (54,600), Londonderry (94,900), and Tyrone (127,600), which together form N. Ireland; and Cavan (71,700), Donegal (136,000), and Monaghan (858,000), which are included in Eire. See separate articles on the cos., also IRELAND, NORTHERN.

had then to be limited to N. Ireland. The Eire authorities retained the original records of Ulster's office, but in 1943 sent certified copies of these records to the College of Arms (see HERALDS' COLLEGE or COLLEGE OF ARMS), in London. In N. Ireland U. K. of A. has all the rights and powers and privileges of his predecessors in Dublin with control of all



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#### TREATMENT OF CHILDREN BY ULTRA-VIOLET LIGHT IN A SPECIAL CLINIC

See A. Chart, *A History of Northern Ireland*, 1928; C. Falls, *The Birth of Ulster*, 1936; E. R. R. Green, *The Lagan Valley 1800-1860. A Local History of the Industrial Revolution*, 1949; D. Gwynn, *The History of Partition, 1912-1925*, 1950; and H. Shearman, *Ulster*, 1950.

**Ulster Constabulary, Royal**, see ROYAL ULSTER CONSTABULARY

**Ulster King of Arms** The office of U.K. of A., which was formerly located in Dublin Castle, and the holder of which had jurisdiction over all Irish arms, as Principal Herald, was, in 1943, after the death of Sir Neville Wilkinson, U.K. of A., transferred to the Heralds College or College of Arms in England and joined to that of Norroy King of Arms, who in consequence is now styled Norroy and Ulster King of Arms. Owing to the altered constitutional status of S. Ireland at that time, the jurisdiction of U.K. of A.

arms of N. Ireland, and he continues to be the prin. officer of the Order of St. Patrick.

**Ulster Rifles, Royal**, see IRISH RIFLES, THE ROYAL.

**Ultramarine**, name given to a substance of a fine blue colour, originally obtained by grinding lapis lazuli. It is now prepared artificially by heating Glauber's salt or soda with kaolin, charcoal, and sulphur, at first with exclusion of air. The dull green product is converted into the blue compound by heating with sulphur with access of air. The U. is made ready for use by washing and levigating. It is stable to light and air, but is decomposed even by weak acids. Aluminium, silicon, sodium, and sulphur are its chief constituents, but its exact composition is not clear. It is used as a pigment for colouring papers and in laundry work.



**Ultramontane** ('beyond the mts.,' i.e. the Alps), term applied to Italy by countries N. of the Alps and transferred to the lt. party in the Rom. Catholic Church, who attach great weight to papal supremacy.

**Ultra-short Waves**, see under RADIO.

**Ultrasonics**, see under SOUND.

**Ultra-violet Light**, invisible to the naked eye, but rendered perceptible by the fluorescence it causes when allowed to fall upon a screen coated with certain substances (e.g. impure calcium sulphide, barium plathio-cyanide, anthracene), consists of light waves of shorter wavelength than those of the visible violet. They range from about 4000 to 2000 Angström units (i.e.  $4 \times 10^{-8}$  to  $2 \times 10^{-8}$  cm.) The fluorescent effect is used in modern 'strip' lighting. U. L. is employed in special microscopes, which require the use of quartz lenses; owing to its short wavelength, better definition is obtained than with ordinary visible light. *Infrared light* has longer waves than the visible red part of the spectrum. It is utilised for therapeutic purposes and also in photography. (See also SUNLIGHT TREATMENT.) Physiologically they are extremely powerful, producing sunburn and causing the formation of the anti-rachitic vitamin D. They are strongly germicidal and, employed under suitable precautions, are very valuable therapeutically. They reach the earth in quantity from the sun, though much U. L. is cut off by a stratum of ozone in the upper atmosphere; and they may be produced artificially by mercury-vapour lamps and arc lamps. Treatment of children suffering from rickets by exposing them to U. L. has proved strikingly successful, while to the healthy person U. L. may act as a general tonic.

**Ultra-Violet Microscope**, see under MICROSCOPE AND MICROSCOPY.

**Ultra-violet Spectrum**, see under SPECTRUM AND SPECTROSCOPY.

**Ultra Vires** (Lat. 'beyond one's strength or power'), legal phrase used particularly with regard to the limitation of the legal or constitutional powers of a person, court, company, or corporation.

**Ulundi**, vil. in Zululand, Natal, 115 m. N. of Durban, the scene of sev. battles between the Zulus and the Brit., especially that of July 4, 1879, when the former were defeated by troops under Lord Chelmsford. U. was the royal kraal of the Zulu kings.

**Ulverston**, mkt. tn. of Lancashire, England, and administrative centre of the Furness dist., is connected by a ship-canal with the estuary of the Leven, and has a large export trade. It is in a mining dist., and has foundries, iron-works, leather tanning, and joining. It is the holiday centre for Furness and the S. Lake dist. Pop. 9,800.

**Ulysses, Ulyx, or Ulixes**, name under which the Gk. hero, Odysseus, was known among the Romans. U., who is the hero of Homer's *Odyssey*, was the son of Laertes and Anticleia (or, according to later tradition, of Sisyphus and Anticleia), king of Ithaca, husband of Penelope,

and father of Telemachus. The story of U., as related by Homer, has been much extended and modified by later poets and mythographers. By Homer he is represented as the model of a prudent warrior, as a man of acuteness, and always ready to devise means of avoiding or escaping from difficulties, as superior to all men in intelligence, in wisdom equal to the gods themselves, and in adversity courageous. Later poets sometimes represent him in a different light, as cunning, and false. During the war against Troy he acted a prominent part as a gallant warrior and as a bold and cunning spy. Some say he devised the stratagem of the wooden horse. After the destruction of the city his wanderings and sufferings began, which form the theme of the *Odyssey*.

**Uma**, or **Purvati**, in Hindu mythology, the consort of Shiva.

**Umballa**, see AMBALA.

**Umbelliferae**, important and widespread family of Dicotyledons, contains about 1600 species. The flowers are characterised by their five free sepals and petals (often minute), five free stamens, and the inferior bilocular ovary formed from two carpels. The stalks of the flowers all spring from the top of the main stalk, so as generally to produce a flat flower-head, the 'umbel.' An example is *Conium* (hemlock).

**Umbel**, natural pigment, containing hydrated oxides of iron and manganese. The earthy pigment is washed and dried at 212° F. It then constitutes 'raw umber' which, calcined, becomes a rich brown colour—'burnt umber.'

**Umbilical Cord**, see FETUS.

**Umbra**, in astronomy means either (a) the darkest portion of the shadow-cone cast by the earth or moon in an eclipse; or (b) the dark central, but not the darkest, part of a sun-spot.

**Umbrella** (Lat. *umbra*, shade), portable protection from the sun or rain, is of great antiquity. Its use was known in China as early as the eleventh century B.C., and anct. sculptures of it have been discovered in Nineveh, Persepolis, and Thebes (Egypt). In the E. the U. was an emblem of rank. In anct. Greece and Rome U. were regarded as effeminate and seldom used by men, but in the twelfth century the Doge of Venice had an U. with the ceremonial significance of a canopy. U. with steel ribs, instead of the hitherto cumbersome cane, were first made about 1840. The manuf. of U. is chiefly carried on in London, Glasgow, Manchester, Paris, and Lyons.

**Umbrella Plant**, alternative name for *Cyperus* (q.v.).

**Umbria**, modern region and anct. div. of Italy, lying between Etruria on the W., the Sabine ter. on the S., Picenum on the E., and the Ager Gallicus on the N. Area 3271 sq. m. Pop. 780,000.

**Umbrian Dialect**, see under LATIN LANGUAGE AND LITERATURE.

**Umbriel**, satellite of Uranus, see under URANUS.

**Umiak**, Eskimo boat, resembling the kayak (q.v.) but of greater size and capacity.

**Umpire**, see ARBITRATION; CRICKET.

**Umrtsar**, see AMRITSAR.

**Umtali**, dist. and township on the E. border of S. Rhodesia. The dist. is nearly 3700 ft. above sea level and lies about 170 m. S.E. of Salisbury and 200 m. N.W. of Beira. It is a gold-mining dist., and the reefs extend across the border into Mozambique, the richest being in the Penhalonga Mts. which rise to a height of 4000-5000 ft. and contain many other minerals besides gold. U. township is the distribution centre to the goldfields of Brit. Manicaland and the E. gate of S. Rhodesia. The European pop. of U. township is 3400.

**Unalaska**, see ALEUTIAN ISLANDS.

**Unamuno, Miguel de** (1864-1936), Sp. novelist and philosopher, b. at Bilbao of Basque descent. He studied at the univ. of Madrid, where he obtained a degree for his thesis on the Basque language. In 1891 he secured settled employment as prof. of Gk. at the univ. of Salamanca. In 1897 he pub. his novel, *Paz en la Guerra*. In 1901 he became rector of the univ., and the following year pub. his second novel, *Amor y Pedagogia*. Vols. of essays on Sp. life and traditions appeared in the next few years, and their revolutionary nature compelled him to resign his rectorship of the univ. He continued to teach there, however, and soon his anti-monarchical writings brought him into collision with the regime of Primo de Rivera. In 1923 he was exiled to the Canaries. He returned to Spain in 1930 and under the Republic he again became rector of the univ. of Salamanca. His temperament, however, was attuned to destructive criticism, and he was soon at odds with the republican regime. For that reason he at first welcomed the Insurrection but later withdrew his support.

The purpose of most of U.'s writings was to reconsider the foundations of belief and conduct and to make men open themselves to new ways of thought. His greatest work was *Del sentimiento trágico de la vida*, which was pub. in 1913 (Eng. trans. *The Tragic Sense of Life in Men and in Peoples*, 1921). See study (with bibliography) by M. Romera Navarro, 1928, and E. Breneis, *The Tragic Sense of Life in Miguel de Unamuno*, 1931.

**Uncials**, see under PALAEOGRAPHY.

**Uncle Sam**, the U.S.A. or rather the gov. of the States personified. The earliest recorded use of the nickname was in the *Troy Post* (Sept. 7, 1813), where it is said to be derived from the initials 'U.S.' on gov. wagons during the war of 1812. A similar but earlier origin is given by some writers who mention one Samuel Wilson, inspector of libert Anderson's store on the Hudson R. in the days of the Amer. War of Independence. The goods bore the contractor's initials, being marked E.A.—U.S. and the latter were jocularly read by the workmen as 'Uncle Sam.' Whichever be the true origin, the nickname began to appear after 1813 in New York newspapers. The earliest use of the name in book form was in *The Adventures of Uncle Sam* (1816) by Frederick Augustus Fidfaddy, Esq., and

some years later it was used in W. Faux's *Memorable Days in America*. Just before the Civil war it had found its way into dictionaries as the accepted sobriquet of the nation. The familiar costume of U.S. was taken from that of 'Major Jack Downing' (see SMITH, SERA), whom he superseded as the cartoonists' national symbol.

**Unconformity**. Where an overlying series of rocks rests upon the eroded edges of an older series, usually having a different dip, the beds are said to be unconformable, and the appearance is termed U.

**Unconsciousness**. While sleep may be regarded as an example of U., the latter term, in its usually accepted meaning, is reserved for conditions like coma, in which there is complete loss of consciousness. There is no voluntary movement of any kind and the patient cannot be roused by shaking or calling or by any external or internal stimulus. Whereas sleep is a normal habitual phenomenon essential to health, the term U., in its usual application, implies an abnormal or pathological state. The depth and duration of a state of U. (which, incidentally, constitutes a prognostic index of some value) will vary with the cause. The precipitating cause of U. is a disturbance of the cerebral circulation and this, in turn, may be traumatic, toxic, or inflammatory in origin. The distribution of the accompanying signs and symptoms is of great value in diagnosing and localising the cause. Thus where the symptoms are unilateral and asymmetrical, the cause may be cerebral haemorrhage, embolism or thrombosis, cerebral tumour or abscess, or cerebral compression due to extra-cerebral haemorrhage. Where they are bilateral and symmetrical, on the other hand, the causative condition may be concussion, sub-arachnoid haemorrhage, post-epileptic coma, uræmia, diabetes mellitus, insulin hypoglycaemia, poisoning by opium, alcohol, barbiturates, etc., meningitis, acute encephalitis, encephalitis lethargica, cholemia, cerebral malaria, heat-stroke, the terminal coma of typhoid, typhus, cholera or cancer, or anaphylactic coma, etc. See also STUPOR.

**Unction**, see EXTREME UNCTION.

**Undercliff**, The, succession of cliffs and terraces sloping towards the sea on the S. coast of the Isle of Wight, England, and extending from Dunnose past Ventnor to Blackgang Chine, which seem to have been formed by landslips. The dist. extends for about 7 m., and is from  $\frac{1}{2}$  m. to  $\frac{1}{4}$  m. in width.

**Underground Dwellings**, or **Souterrains**, have a very wide geographical distribution. They are found in China, Korea, and Japan, along the N. bounds of the Old World as far as Scandinavia; they occur in Iceland, Greenland, and N. America, and in one form or another in most countries of Europe. They vary as much in form as in distribution, and in date range from prehistoric to modern times. In essence, an underground dwelling is simply a cave or house sunk into the ground for the sake of protection

from weather and additional warmth. In later stages of development, the underground dwelling becomes a mound dwelling, and at Skara Brae in the Orkneys Neolithic houses made of local flagstones were built into hollows in the sand-dunes. In Britain there are sev. varieties of underground dwelling which are often described merely as pit-dwellings. At Farnham, Surrey, shallow pits which may have had a conical roof of wattles were the homes of people in the Mesolithic stage. Many pits of the Neolithic period are known, especially in the causeway-forts; examples were found at the Trundle, Sussex, and at Maiden Castle, Dorchester. The real underground retreats called 'fogous' to be seen in the Land's End dist. of Cornwall are usually on hill-sides either in or close to vills, and forts, and date from the end of the Early Iron Age well into the period of the Roman occupation.

In Scotland, the well-known beehive huts or 'weems' were sometimes sunk into the ground; in the N.E. of Scotland, certain of the U.D. are of prehistoric date, but S. of the Forth they were in use as late as the second century A.D. U. D. in Ireland excavated by the application of modern technique are proved to have been inhabited between A.D. 500 and A.D. 1000.

**Underground Electric Railway Company of London, Ltd.**, registered in 1902, when it absorbed the Metropolitan Dist. Electric Traction Company (registered in 1901 to electrify the Metropolitan District Railway). The company constructed the Charing Cross, Euston and Hampstead, Great Northern, Piccadilly and Brompton, and Baker Street and Waterloo Railways, which were all amalgamated as from July 1910 as the London Electric Railway Company. In 1912 the company acquired control of the London General Omnibus Company and in 1913 the City & South London Railway Company and the Central London Railway Company. Under an Act of 1915 the City & South London, Central London, London Electric and Metropolitan District Railway Companies and the London General Omnibus Company, in all of which the U.E.R. Company was largely interested, entered into a pooling agreement. In 1928 was acquired control of the London and Suburban Traction Group. In 1933 the whole group of underground railways, together with the L.G.O.C. and Tramways Companies were transferred to the London Passenger Transport Board (q.v.), estab. to provide for a co-ordinated system of passenger transport for the London passenger transport area as defined in the Act creating the board.

**Underground Movements**, see GUERRILLAS; RESISTANCE MOVEMENTS.

**Underhand Stopping**, see under MINING.

**Underpinning**, see under SHORING.

**Under-sheriff**, see SHERIFF.

**Understanding**, in philosophy, a term used in two somewhat different senses. By the older Eng. philosophical writers, such as Locke and Hume, it is used to denote the human mind in general and the human intellect in particular in

opposition to the faculties of emotion and volition. It is now more used in the sense given it by Kant and developed by Hegel. In this sense U. is the lower faculty of the mind which deals with phenomena, while reason is the higher faculty dealing with noumena or universals.

**Underwriter**, see INSURANCE.

**Undeveloped Land Duty**, see LAND TAXES.

**Undines**, name given in the fanciful system of the Paracelsists to the elementary spirits of the water. They are of the female sex. Baron de la Motte Fouqué made of this fancy an exquisite tale, entitled *Undine* (1811, Eng. trans. 1912).



Royal Norwegian Embassy

#### SIGRID UNSET

**Undset, Sigrid** (1882-1949), Norwegian novelist, b. at Kallundborg, Denmark. She was educated at Christiania (Oslo) Mercantile College, but she was forced to begin working as a clerk in 1898. Her first success was with the novel *Jung* (1912; Eng. trans. 1927) in which she wrote as the champion of family life against the dull, cheerless existence of a business career. She did not write in the style of her time which treated 'art' and 'love' as separate concepts from home and home, but advocated a natural and social love between man and woman. She became a Rom. Catholic after the First World War, and wrote a remarkable trilogy of historical novels, *Kristin Lavransdatter* (1920-22, Eng. trans. 1923-27). She received the Nobel Prize for literature in 1928.

**Undue Influence**. In law a contract to which a party has been induced to

give his consent by the exercise of U. I. on the part of another is voidable. So also a will can be attacked by interested parties on the same ground. Presumptions of U. I. arise generally in connection with gifts. It is entirely a question of fact whether in any particular case U. I. was used. The law will not presume U. I. until it is first proved that the relationship between the parties was or is such that one of them was likely to be able to exercise his influence over the other, and then it is open to the defendant to rebut the inference from such relationship. The relations of solicitor and client, parent and child, guardian and ward, trustee and beneficiary are all presumed to give the former in each case influence over the latter. But the strength of the presumption depends entirely on the intimacy of the relationship, e.g. that of a doctor and his patient is in most cases not nearly so close as that of a guardian and ward. U. I. is not in any way a doctrine specially connected with defective will-power, though such fact, if present, may be a strong element for the consideration of judge or jury.

**Undulant Fever, see MALTA FEVER.**

**Undulatory Theory, see INTERFERENCE, LIGHT, OPTICS, etc.**

**Unemployment**, term applied technically to the condition of those willing and able to work for wages and registered for employment in industry but unable to secure either full or partial employment because the industry concerned fails to provide a sufficient amount of work to be done.

From the reign of Queen Elizabeth, when the vagrant or vagabond class had increased so as to require legislative attention, the only remedy the state had to offer was the Poor Law system, and in extending out-door relief the policy of the Poor Law ignored all distinctions between the destitute through trade depression and the congenital loafer or 'unemployable.' The recognition of the differences between the class of unemployed who are of good character and can show good industrial records, the aged, infirm, or inefficient unemployed, and the morally defective unemployed, has at least resulted in an endeavour to meet these different classes with different remedies. (See under EMPLOYMENT EXCHANGES; LABOUR COLONIES; NATIONAL INSURANCE.)

During the period between the two World Wars, U. assumed the importance

of an acute world-problem. The chief causes were: (1) disorganisation of the labour market; (2) a surplus of available labour, together with a surplus of manufactured goods, and (3) under-consumption. Other contributory causes include excessive wages. Tariffs, too, are theoretically a potential cause of U. where they lead to restricted markets, though in Britain, a large section of the pop. in the 1930's came to believe that Britain's continuance of free trade when other countries had adopted protection was making her a dumping ground for cheap foreign goods, and thereby causing vast U. among British workers.

In the United Kingdom industrial depression began to cause U. soon after the end of the First World War, and by 1921 the number of unemployed had risen from about 700,000 to over 2,000,000 (excluding those idle through industrial disputes). The number continued above the million mark, but during the twenties was confined mainly to the coal trade and to a limited number of other industries dependent on overseas markets in which there was a decreasing demand for Brit. goods. The General Election of 1929 was largely fought on the U. issue and resulted in a Labour victory, due to the hope of increased employment and a more generous administration of the U. Insurance Acts, which had hitherto debarred from benefit any classified as 'not genuinely seeking work.' The economic depression of 1931 followed, and by 1932, U. had reached its highest total with 2,947,000 or 22 per cent of the insured working pop. Legislation during the 'thirties was aimed at developing new industries in what came to be known as the 'special' or 'development' areas where U. was heaviest. The problem persisted, however, until 1939 when with the coming of war it ceased any longer to be a problem.

The total working pop. available for civilian employment in Great Britain was 19,750,000 in June 1939 (14,656,000 men and 5,094,000 women). In June 1948 and June 1949 it was over 23,000,000, and continued at this figure into 1950, including approximately 16,000,000 men and 7,000,000 women. The average number of unemployed in Great Britain included in these totals was 303,570 in 1948, 307,965 in 1949, and 355,329 in 1950 (monthly average Jan.-April). An analysis of these figures compared with those for 1939 is shown in the following:

Year	Wholly Unemployed		Temporarily Unemployed		Total
	Male	Female	Male	Female	
1939	934,332	258,088	137,192	78,347	1,407,959
1948	225,666	70,567	4,289	3,148	303,570
1949	223,219	76,913	4,752	3,081	307,965
1950	246,999	99,088	5,701	3,541	355,329

*U. in the U.S.A.*—Workers are insured under State U insurance laws, which require contributions from employers at statutory rates. Employers are also taxed under the Federal U. Tax Act, which assesses the rates in accordance with the amounts contributed under State laws. In 1948-49 some 5,600,000 unemployed received benefit under the State systems, an increase of nearly fifty per cent over the number for 1947-48.

During the ten years 1930-39 the average number of unemployed was 8,500,000 out of a total working pop. of over 51,000,000. In post-war years the working pop. has increased, and the number of unemployed have very much declined, averaging about two million. The year 1948 in particular was a year of high employment with a total working pop. of 63,166,000 (Oct. 1948) including 1,642,000 unemployed. This compares favourably with the previous year (Oct. 1947) when there were 1,687,000 unemployed out of a smaller working pop. of 62,219,000. U increased in 1949 3,778,000 (June 1949), but in 1950 fell to 3,200,000 (July).

See B. S. Rowntree and B. Lasker, *Unemployment: A Social Study*, 1911; J. M. Keynes, *General Theory of Employment, Interest, and Money*, 1936; and W. H. Beveridge, *Unemployment, A Problem for Industry*, 1930, and *Full Employment in a Free Society*, 1944.

**U.N.E.S.C.O. (United Nations Educational, Scientific, and Cultural Organisation).** The purpose of this organisation, which includes forty-four member states according to its Constitution (Nov. 16, 1945) is 'to contribute to peace and security by promoting collaboration among the nations through education, science, and culture in order to further universal respect for justice, for the rule of law, and for the human rights and fundamental freedoms which are affirmed for the peoples of the world, without distinction of race, sex, language, or religion, by the Charter of the United Nations.'

Commissions were estab. to cover the following subjects amongst others: economics and employment; transport and communications; statistics; human rights; social studies; the status of women; narcotic drugs; population; and aid to war-devastated countries. One of U.'s chief activities would seem to be to conduct preliminary investigations of such problems which the member nations must solve for themselves. See J. Huxley, *U.N.E.S.C.O.; Its Purpose and its Philosophy*, 1946.

**Unfunded Dept.,** see under PUBLIC DEBT.

**Ungava**, former dist. of Labrador, Canada, occupying all the interior of the peninsula now known as the Territory of U. It was annexed to Quebec in 1912 under the Quebec Boundaries Extension Act. Area 351,780 sq. in. It contains numerous lakes and is watered by many small rivs. Fort Chimo is the chief port. Furs are obtained and iron, lead, copper, and other minerals are found.

**Unguent**, see OINTMENT.

**Ungulata**, large order of hoofed mam-

mals, including the Ruminantia and Pachydermata of Cuvier. The feet are never plantigrade and the toes are never clawed, and number more than four only in the elephants (Proboscidea).

**Ungvar**, see UZGOROD.

**Uniat**, member of any community of oriental Christians that acknowledges the pope's supremacy, but retains its own liturgy and anct. rites. Their clergy marry and administer the communion in both kinds.

**Unicorn** (Lat. *unus*, one; *cornus*, horn), fabulous animal referred to by Gk. and Lat. writers. It was said to be a native of India, resembling a horse in shape and size, and having one straight horn 1½ cubits long on its forehead. The U. was later confused with the rhinoceros. The O.T. use of the word (as in Deut. xxxiii. 17) is a trans. of 'wild ox.' The figure is used in heraldry. See O. Shepard, *The Lore of the Unicorn*, 1930.

**Uniflow Engines**, see under STREAM ENGINES.

**Uniform (Military).** *Army.*—Military U.s. were first introduced into England by the Tudor kings whose first political act on attaining the throne was the abolition of the feudal armies which had fought the wars of the Roses. Those retainers of great lords were distinguished not so much by their whole dress as by the badges of their employers. The legislation of Henry VII. restricted the wearing of livery to domestic servants and specifically forbade the wearing of badges. This prohibition remained under Henry VIII, who formed the Yeoman of the Guard whose U. is the oldest extant in England.

Until the end of the seventeenth century the army was clothed either as household troops (at first only the Yeomen of the Guard) whose U. was wholly or partly red, or as line regiments raised by officers under royal licence. The latter were both clothed and paid by the officer who raised the regiment, and thus clothing was usually uniform within a regiment (the cloth having been bought in bulk by the colonel or his agent) but there was no uniformity outside these limits. After 1660 General Monk's (two regiments of foot became household troops and adopted the red livery, as did the emirs of the Life Guards. But the re-enlisted republicans of the earl of Oxford's troop of Horse Guards were clothed in blue, which colour they still retain. During the later Stuart and early Hanoverian reigns an attempt was made to reduce the diversity of clothing to a system, and by 1756 there was a generic type of U. common to all units of an army; all infantry were in general dressed alike with different facings for each regiment, and distinctive articles of dress for grenadiers and fusiliers.

Regional costume has played some part in the design of U.s., for instance in the kilts and hose of the Highland regiments and in the latter-day cauboon and green plume of Irish regiments. But items of foreign uniform have been adopted either because new arms have been introduced from abroad, or because the military prestige of a certain power has induced

others to imitate its U. Thus the full-dress (which is the nineteenth century active service dress) of lancers and hussars is of Polish and Hungarian origin respectively.

The beret which by 1945 had become almost universal in the Brit. Army was borrowed from the Fr. *Chasseurs Alpins*, and the forage cap which preceded it had a wide vogue on the continent, being ultimately of Austrian origin. Thus is an example of imitating a defeated power which was followed in 1949 by the tentative introduction into the Brit. army of an active service dress which included a greatcoat of distinctly German cut and a variety of the Ger. *Einheitsmütze*, a peaked cap originally worn by the Austrian *Kaiserjäger*, then by Ger. mt. troops, then by the *Afrika Korps* and finally by all Ger. infantry.

Since 1900, when protective colouring was adopted on a large scale as a result of experience in S. Africa, considerations of utility have predominated; all armies have introduced a 'sad-coloured' fighting garb, and as arms and equipment become ever more expensive there has been a tendency to save money by discarding parade dress.

For illustrations of badges of rank and appointments in the Brit. Army, see ARMY.

**Navy.**—Throughout the Middle Ages seamen wore ordinary clothing, but in the reign of Richard II. (1385) a sea gown was worn, and this lasted until the days of the Stuarts. During the Tudor period, the colours were green and white, changed in the reign of Charles I. to red and yellow. They so remained for officers until the estab. of a proper naval U. in 1748, for which George II. decided that the colours of the duchess of Bedford's riding habit (blue faced with white) should be adopted. Meanwhile, a certain uniformity in seamen's attire had begun in 1628 due to the issue of 'slop' clothing on repayment. It was for long the custom of captains to dress their boats' crews and even ship's companies in special rigs. U. proper was not introduced for men until 1857 and consisted of the blue cloth jacket and trousers from which has developed their rig to-day. The sailor collar dates its origin from the time when sailors wore 'pig-tails,' and prevented the latter from soiling their uniform. The change in officers' U. followed that of contemporary fashion, the present monkey jacket replacing the blue tunic in 1879. Hats were not mentioned in the regulations until 1825, when a cocked hat to be worn fore and aft was ordered. Caps were introduced in 1833. Mess-dress and undress were regularised in 1891, as well as white U. for tropical wear. Gold stripes as an indication of rank were first authorised in 1861, and in 1918 all officers were allowed what was previously the 'executive' curl to the top stripe.

**Royal Air Force.**—The U. is blue-grey in colour and there are two types—a best dress, known as No. 1 (Home) Dress, for officers, and as Service Dress for airmen, consisting of jacket with brass buttons

and trousers, worn on ceremonial and other special occasions, and for walking out, and another, called No. 2 (Home) Dress (formerly known as battle, or war service dress), consisting of blouse and trousers, which is the normal working dress. In overseas commands a tropical U. of khaki drill is worn in the hot seasons. Officers wear peaked caps with No. 1 (Home) Dress. The once familiar field service cap is now obsolescent, being replaced by the beret for wear with both forms of dress by airmen and with No. 2 (Home) Dress by officers.

**Royal Air Force U.** (with the exception of No. 2 (Home) Dress) has remained substantially the same in design since the formation of the R.A.F. in April 1918, although until the end of the First World War, it was made of army khaki cloth. Before the Second World War a full dress U. of which a plumed cap, ornamented with black fur, somewhat similar in design to a hussar's full dress headgear, was a conspicuous feature, was worn by officers, but this is now obsolete.

See also RANK

See *A Representative of the Clothing of . . . all the Forces upon the Establishment of Great Britain and Ireland, 1742; W. Richards, Her Majesty's Army, 1888; C. C. P. Lawson, A History of the Uniforms of the British Army to 1760, 1939-41.*

**Uniformity, Acts of,** series of Acts passed by Parliament for the regularising of public worship in England. The Act of 1549 directed the clergy to conform to the new prayer-book of that year. The new prayer-book of 1552 was accompanied by an Act which prescribed its use by laity and clergy. The Act of 1559 imposed the Elizabethan prayer book on the whole kingdom, and required all persons to attend their par. church. The best-known Act, however, is that of 1662. This required the revised Liturgy of that year to be used in all churches and places of worship. The 1872 Act authorised certain shortened forms of services and made provision for special services.

**Union, or Tokelau,** group of islets in the Pacific, 350 m. N.E. of Samoa. The prin. are Fakaofu, Nukunono, Nassau, Atafu, and they belonged to Britain, being included in the Gilbert and Ellice Isles, until 1926, when they were transferred to New Zealand under the administration of W. Samoa: from Jan. 1, 1949, they became a part of New Zealand. Copra is the chief product. Area 4 sq. m. Pop. 1400.

**Union, or Workhouse,** see POOR LAWS.

**Union Bank of Scotland Limited, The,** was founded in Glasgow in 1830 under the title of The Glasgow Union Banking Company with a paid-up capital of £400,000. A vigorous policy of expansion was pursued from the outset and by 1843 the bank had absorbed the majority of Scotland's prin. private banks, including Sir Wm. Forbes, James Hunter & Co., Edinburgh, the Paisley Union Bank, the Ayr and Kilmarnock Banks, and the Thistle and Glasgow and Ship Banks, of Glasgow. The Ship Bank, which commenced business in 1750, had the distinction of being

the first successful bank to be formed outside Edinburgh. The process of country-wide amalgamation was completed by the absorption in 1849 of The Banking Company in Aberdeen, founded in 1767, and of the Perth Banking Company in 1857. In 1843 the title of The Union Bank of Scotland was adopted. In the same year the paid-up capital was increased to £1,000,000 and it remained at this amount until 1930 when it was raised to the present (1949) figure of £1,200,000. The first London office was opened in 1878 at the corner of Cornhill and Bishopsgate and three other London branches have since been opened. The head offices are in St. Vincent Street, Glasgow, and in George Street, Edinburgh, and there are 200 branches in Scotland.

**Union-Castle Line, The.** This shipping line was formed in 1900 by the amalgamation of the Union Line (founded 1853) and the Castle Line (founded 1872). In 1857 the Union Line inaugurated the Cape Mail service by the dispatch of the R.M.S. *Dane*, a vessel of 530 tons, from Southampton to Cape Town. The direct mail service was extended to Port Elizabeth in 1864; to East London in 1876; and to Durban in 1887, the mail contract having been renewed in 1863 and again in 1868. The Castle Line was founded by Donald Currie in 1872 and quickly established an important position in the South African service. In 1876 the Castle Line shared the mail contract with the Union Line, the Castle Line vessels sailing from London instead of Southampton. There was very keen competition between the two companies. At the time of the amalgamation in 1900, both fleets were of approximately equal size, the Union Line having 19 vessels totalling 101,107 tons, and the Castle Line 20 vessels totalling 108,886 tons. In 1949 the Union-Castle fleet consisted of 26 vessels and one under construction, aggregating 395,828 tons, and operating mail, passenger, and cargo services between the United Kingdom and South and East African ports. Mauritius, etc., also a cargo service between the U.S.A. and S. and E. Africa. The largest ships of the line are the *Pretoria Castle* and the *Edinburgh Castle*, both of 28,705 tons; *Capetown Castle* 27,002 tons; *Abilene Castle* 25,567 tons; *Stirling Castle* 25,554 tons; *Carnarvon Castle* 20,122 tons; and the *Winchester Castle* 20,012 tons.

**Union City**, city of Hudson co., New Jersey, U.S.A., on Hudson R., opposite New York. There are silk manufs. The city was formed in 1925 by the amalgamation of Town of Union and W. Hoboken. Pop. 56,100.

**Union (Irish).** The U. of Great Britain and Ireland was effected on Jan. 1, 1801.

It was dissolved in 1921, when the Irish Agreement of Dec. 6 was concluded. See further under **IRE**, and **IRELAND**, *History*.

**Unionist**, see **CONSERVATISM**, **CONSERVATIVE PARTY**; **POLITICAL PARTIES**.

**Union Jack**, see **LA FLAG**.

**Union, La.**, see **LA UNION**.

**Union of the Churches**, attempts to

unite various Christian denominations which differ in their creeds and methods of Church gov. It must be distinguished from the Eng. Church Union (see **CHURCH UNION**), with which it has no connection. A recent example of U. is the S. India Church scheme which sanctions intercommunion between a number of non-Rom Catholic denominations, including Anglicans and Methodists. Other examples include the efforts in Canada where nine different unions of Presbyterians were effected between 1817 and 1875 and among the Methodists sixteen different bodies were united at different periods between 1820 and 1884. In 1925 the Methodists, nearly all the Congregationalists, and about two-thirds of the Presbyterians merged in the United Church of Canada. In 1929 the union of the United Free Church of Scotland (itself already a union), and the Church of Scotland was effected. In many cases there are very few doctrinal differences dividing some denominations, and their divs. are largely a matter of Church gov., as with the Wesleyans, Primitive Methodists, and United Methodists, who formed the Methodist Church in 1932 in England. The Rom. Catholic Church has proved adamant in all conversations on reunion, and there seems no immediate hope of its union with any other Churches except on its own terms. See H. Martin, *A Christian Plea for Reunion*, 1911; The Very Reverend Father Vincent McNabb, *The Church and Reunion*, 1937, written from the Rom. Catholic point of view; G. K. A. Bell, Bishop of Chichester (ed.), *Documents on Christian Unity* (3 series), 1920 to 1948.

**Union Pacific Railroad**, one of the greatest railway systems in the U.S.A. It was chartered under an Act of Congress in 1862, when it was considered necessary to have more railways, primarily for the purposes of pursuing the Civil War. To-day the system embraces 10,000 m. of railway, running through thirteen states. The connection of the railroad with the Central Pacific at Promontory, Utah, 50 m. W. of Ogden, in May 1869, completed this the first transcontinental railroad. In the main, it covers the ter. from Council Bluffs and Kansas City in the E to the great Pacific coast cities of Los Angeles, Portland, and Seattle, serving Denver, Cheyenne, Salt Lake City, Tacoma, and Olympia.

**Union of Socialist Soviet Republics.** This union was set up in 1922, five years after the beginning of the Russian Revolution. Delegates of the four prin. Soviet Republics met at Moscow on Dec. 30 of that year and concluded a Treaty of Union establishing a Union of Socialist Soviet Republics. See **RUSSIA**.

**Union of South Africa**, see **SOUTH AFRICA**.

**Unit**, see **UNITS**.

**Unitarianism.** The term, in its strict and literal sense, denotes simply belief in one God, and when thus understood is a generic term applicable not only to Christianity but also to Judaism, Mohammedanism, and every form of monotheism.

But it is almost invariably used as the designation of the belief held by certain Protestants who, while rejecting the scheme of orthodox theology as a whole, nevertheless acknowledge the pre-eminent position of Jesus Christ in the world's hist. as a teacher of religion and a prophet of righteousness. A modern summary of the Unitarian faith enumerates the Fatherhood of God, the Brotherhood of Man, the Leadership of Jesus, the Victory of Good, the Kingdom of God, and the Life Eternal. The Eng. Unitarians trace their descent from those Presbyterians whose ministers were ejected in 1662, many of whose chapels are now in Unitarian hands. Many Amer. Congregationalists are also Unitarian in belief. U. has continued in England under such leaders as Priestley, Martineau, Thom, Spears, Drummond, Wicksteed, Stopford Brooke, Estlin, Carpenter, and through the influence of the Amers. W. E. Channing and Theodore Parker. Its ministers are trained chiefly at Manchester College, Oxford, the Unitarian College, Manchester, and the Presbyterian College, Carmarthen. In 1928 was formed the 'General Assembly of Unitarian and Free Christian Churches.' The Assembly has about 300 ministers, 340 chapels and other places of worship in Great Britain and Ireland. There are some 300 churches in the U.S.A., nearly half in Massachusetts; the membership numbers 75,000. See T. E. Manning, *The Religion and Theology of Unitarians*, 1906; S. A. Elliot, *Heralds of a Liberal Faith*, 1910; J. E. Carpenter, *Unitarianism: a Historic Survey*, 1923; E. M. Wilbur, *Our Unitarian Heritage*, 1926; A. History of Unitarianism, Socialism, and its Antecedents, (2nd ed.), 1946; W. G. Tarrant, *Story and Significance of the Unitarian Movement*, 1948; A. Hall, *Beliefs of a Unitarian*, 1948.

**United Brethren in Christ.** This denomination resulted from the religious awakening of Philip William Otterbein, Martin Boehm, and their collaborators, the church itself having its inception at a meeting held about 1766 near Lancaster, Pennsylvania. The church was formally organised in Frederick Co., Maryland, in 1800. In 1916 the U.B.C. merged with the Evangelical Church to form the Evangelical United Brethren Church.

**United Free Church of Scotland.** Scottish Presbyterian body, formed in 1900 by the union of the United Presbyterian Church and the Free Church of Scotland (q.v.). This union was the result of a long series of negotiations prompted by a strong and general desire for reunion, but the minority of the Free Church, who had refused to join the union, lost no time in testing the legality of the Act of the majority in entering it. See further under FREE CHURCH OF SCOTLAND. In 1929 the U.F. united with the Church of Scotland.

**United Irishmen,** league founded in 1791 by Theobald Wolfe Tone, mainly in order to secure the political emancipation of Rom. Catholics and Dissenters. Its organisation was largely a result of the movement connected with the Fr. Revolution, and it was marked by a vigorous anti-

pathy to everything Eng. It brought about risings in the N. of Ireland in 1797 and 1798, marked by bloody atrocities. Help was expected from France, but none came, and the rebellion was subdued.

**United Kingdom,** comprises the political entity of England, Wales, and Scotland. The title, prior to the Irish Treaty of 1921, was the 'United Kingdom of Great Britain and Ireland.'

**United Methodist Church,** see under METHODISM.

**United Nations, Charter of the,** instrument for maintaining peace which the great powers offered the world in place of the covenant of the League of Nations at the conference of the United Nations held in San Francisco. (On the origins of the charter see SAN FRANCISCO CONFERENCE.)

The main purposes of the C. of the U. N. are the maintenance of peace on the basis of justice and the promotion of friendly relations and co-operation in all matters; but the United Nations are also committed to the collective encouragement of respect for human rights and for fundamental freedoms for all without distinction as to race, sex, language, or religion. The principles recognise the sovereign equality of all Member-States of the Organisation (U.N.O.) and bind Members to fulfil their obligations under the charter in 'good faith,' and to settle their disputes in such a way that neither peace nor justice are endangered. The Organisation is to ensure that States which are not Members observe the same principles, as far as is necessary for maintaining peace. It is expressly stated that the Organisation has no power to interfere in the internal affairs of a State except in so far as this may be necessary when the Council is taking action to compel the settlement of a dispute. The Charter provides that all Member-States shall be represented in the General Assembly by not more than five delegates. The Assembly may discuss all matters relating to peace and security and make recommendations *except* when the Security Council is dealing with an international dispute. In that case the Assembly must not make any recommendation on the subject unless the Security Council asks it to do so. On all other matters (e.g. international law, health, and social questions), the Assembly shall 'initiate studies' and make recommendations. Under the Charter the Assembly apportions the expenses of U.N.O. and approves its budget. The Security Council consists of eleven Member-States, five of whom shall be Britain, China, France, the U.S.A., and the U.S.S.R. These are permanent members. The other six are elected by the Assembly and serve for two years. The Council acts on behalf of the whole U.N.O. in the settlement of disputes. It must seek peaceful settlement, by methods specifically laid down in the Charter. At any stage of a dispute which the parties are trying to settle peaceably, the Council may recommend a means of settlement. The disputing parties are obliged, in any case, to refer



the dispute to the Council if they fail to reach agreement. The course of action of the Council when it decides that there is a threat to peace or an act of aggression, is also laid down: *inter alia*, it may call on members of the United Nations to interrupt economic relations, to stop communications, and to sever diplomatic relations with any State or States, and if these and other prescribed methods fail, it may call for a demonstration of force or for actual military operations by some or all Member-States. For this purpose each Member-State must agree with the Council, by a separate treaty, upon the nature and extent of the forces it can supply on call. Each Member-State also undertakes to hold an air-force contingent, of an agreed strength, in readiness for immediate action. In all plans for collective action and for the strategic direction of joint operations, the Council will have the assistance of a Military Staff Committee. All Member-States keep the right of self-defence if attacked with armed force before the Council deals with the situation. An additional responsibility of the Council is to make plans for the reduction of armaments, and in this it will be assisted by the Military Staff Committee. Voting on the Council is as follows: all decisions will require an affirmative vote of at least seven out of eleven members. There is no other stipulation for 'matters of procedure,' but in all more important decisions all the five permanent members must be agreed. A State, however, which is a party to a dispute must abstain from voting if the dispute is under consideration for peaceful settlement. The Charter does not preclude regional arrangements between groups of States for the purpose of maintaining peace. Member-States who are parties to such arrangements should use them for the peaceful settlement of local disputes, reporting all measures to the Security Council; but no 'enforcement action' should be taken under a regional arrangement except with the authorisation of the Council, or in the case of an attack by one of the States who have been enemies of the United Nations in the Second World War. Provision is made for setting up an Economic and Social Council of eighteen Member-States elected in the Assembly for a term of three years at a time. Its general objects are to promote higher standards of living, full employment, the solution of international, economic, social, and health problems, universal respect for the observance of human rights and fundamental freedoms. The Charter also provides that Member-States which administer colonial empires subscribe to the principle that the interest of native inhabitants is paramount. Under this chapter of the Charter an International Trusteeship system has been established for the administration and supervision of existing mandated territories, which thereafter might be detached from enemy States as a result of the Second World War, and territories which might be voluntarily placed under the system by their administering States.

Provision is made for an International Court of Justice to be set up by a special Statute, to be the main judicial organ of the United Nations and to give an advisory opinion on all legal matters as well as adjudicating in justiciable disputes. All Treaties must be registered with the Secretariat of U.N.O. and published by it, otherwise they will not be recognised by the U.N.O. Obligations under the Charter over-ride any other Treaty obligations for Members of the United Nations. Amendments of the Charter require a two-thirds majority of the Assembly, including all the Great Powers, providing the votes are ratified by the Governments in each case.

As late as the opening of the fourth General Assembly (Sept. 1949) virtually all the acute political problems before the Security Council and other organisations remained in a state of deadlock chiefly as a result of what was styled the Russian 'peace offensive.' Fundamental differences existing between W. and E. had further diminished the effective working of the Security Council in its subsidiary bodies in all but active conflicts, but for this very reason added weight was now given to the position of the General Assembly.

The fourth Assembly took decisions on Palestine, the It. colonies, and the responsibilities of colonial Powers. These decisions included a plan for an international regime in Jerusalem and the surrounding area; a compromise solution establishing Libya as an independent and sovereign state by Jan. 1, 1951, and providing for It. trusteeship over It. Somaliland. The above decisions were reached by majority voting. The most revolutionary concept in the Charter of the U.N. is the use of majority voting to decide matters of substance. The risks of the majority procedure, however, were limited by giving each of the permanent members of the Council the right of veto and by restricting the powers of the Assembly to discussion and recommendation. To some extent these prudent precautions were justified by the dispute between Russia and the W. Furthermore the abuse of the veto by Russia in the Council imposed a correspondingly greater burden on the Assembly than it was ever intended to bear.

It was never foreseen that the Assembly would be asked to give decisions, as opposed to recommendations, nor was it foreseen that it would be invited to decide on such complex problems as Palestine and the It. colonies. The dangers of this development were not apparent to the Western Powers, because on most issues the majority of the Assembly were always on their side against the Soviet Union and its satellites. But by the end of the fourth Assembly it was evident that there were other majorities: a majority of small powers against great powers, of powers without colonies against colony-owning powers, and a majority of non-European powers against the older nations of Europe.

The first supreme test of the efficacy of the U.N. organisation in resisting aggres-

sion came in June 1950, when the Security Council decided (June 27) to invoke the provisions of the charter for the use of military sanctions against the N. Korean Communist-directed attack on the Republic of S. Korea. As a measure of collective security the council's action was unprecedented. The seven affirmative votes in the council all came from the W. States but in a few days some forty nations had endorsed the action taken. According to the charter Russia, one of the five permanent members of the council, should give a concurring vote in any decisive recommendation. Owing to Russia's boycott of the council, however, a convention had evolved (acknowledged in the past by Russia itself) under which the abstention of a permanent member at the time of voting should not be counted as a 'veto' against the vote, and it seems to be assumed that in this context 'abstention' is the same thing as 'absence.' Subsequently the Russian deputy foreign minister (Gromyko) denounced the Amer. intervention as inspired by aggressive plans and as an unwarranted intervention in the domestic affairs of Korea. The Russian case against the United Nations was based partly on the theory that this was a civil war, in which the contending parties were the legal gov. of Korea estab. in the N. and the dissident S. Korean authorities. The Korean crisis burst on the world on June 26. Within less than three days the whole scene changed with Truman's announcement that the Amer. navy and air force had been ordered into action. Within another twenty-four hours Brit. warships were operating with the Amer., and Commonwealth countries were pledging full support for the Council resolution to render immediate help to S. Korea. France, the Netherlands, Belgium, and Siam were among other countries which soon afterwards offered military co-operation. See further under UNITED STATES, History.

See *Proceedings of the Gen. Assembly; Official Records of the Security Council, the Economic and Social Council and the Atomic Energy Commission; Year-book of the United Nations* (1948); *Everyman's United Nations* (1948); *U. N. Year-book on Human Rights* (1946); and H. V. Evatt, *The United Nations* (1949).

**United Nations Educational Scientific and Cultural Organisation**, see UNESCO

**United Nations Relief and Rehabilitation Administration (U.N.R.R.A.)**, formed in 1943, when as yet peace was far distant, to meet what were seen to be two broad needs after the termination of hostilities, viz. immediate relief, and assistance in economic rehabilitation. U.N.R.R.A. was compelled, by the conditions it found, to concentrate primarily on the former. Its function was, moreover, limited to helping those war-ravaged countries which lacked the foreign exchange resources to meet their own import requirements. The administration's major operations were virtually completed by the earlier half of 1947, but its activities had by then estab. the foundation for the future

measures to be taken in the direction of world economic well-being.

The first shipload of U.N.R.R.A. supplies was sent in March 1945. By the close of its operation, U.N.R.R.A. had delivered about \$3,000,000,000 (£50,000,000) worth of supplies, in volume 25,000,000 long tons, to seventeen different countries.

**United Nations War Crimes Commission**, international corporation estab. in Oct. 1943 at a meeting of the representatives of seventeen nations held at the Brit. Foreign Office. Originally the Commission was intended to 'investigate and record the evidence of war crimes' and to 'report to the Governments concerned . . .'. But it was eventually decided that it should also be charged 'with advising the Governments concerned upon matters of a technical nature, such as the sort of tribunals to be employed for the trial of war criminals, the law to be applied, the procedure to be adopted, and the rules of evidence to be followed.' It was not, however, empowered to make any decisions which would be binding upon the govts. for the guidance of which it made recommendations. The Commission had no executive power and no detective staff or agency. Responsibility for the apprehension of wanted persons rested with the military or other national or occupation authority. When, however, a criminal had been listed the Commission might give advice to prosecuting and registering agencies with a view to making the prosecution of persons charged with war crimes effective. Early in 1944 the Commission recommended to the allied govts. that the retributive action of the United Nations should not be restricted to what was traditionally considered a war crime in the technical sense, i.e. a violation of the laws and customs of war, particularly embodied in The Hague and Geneva Conventions. Their proposals had much influence on the conclusion of a Four-Power Agreement dated Aug. 8, 1945, establishing the International Military Tribunal, in particular on its provisions for the punishment of 'crimes against humanity,' which include murder, extermination, enslavement, deportation, and other inhuman acts committed against any civilian pop. before or during the war. The Allied govts. also accepted the view of those of the members of the Commission who held that in the state of International Law as it existed in 1939 the initiation of an aggressive war was not only illegal but criminal. This view was included in the Four Power Agreement and was upheld in the judgment of the Nuremberg Tribunal, (q.v.). The Commission also recommended that measures should be taken against the members of criminal organisations, such as the Gestapo. The recommendation of the Commission for the setting up of a United Nations War Crimes Court and of mixed inter-allied military tribunals for the trial of persons indicted of war crimes influenced not only the creation of the Nuremberg court but also the estab. of various tribunals all over the world, invested with jurisdiction

over war crimes. *See also* CRIMES, WAR.

**United Presbyterian Church**, *see* SCOTLAND, CHURCH OF.

**United Provinces of Agra and Oudh** or **Uttar Pradesh** (formerly **North-western Provinces and Oudh**), in India, are situated in the valley of the Upper Ganges. The prov. is bounded by the E. Punjab and Tibet on the N., Nepal and Bihar on the E., the States of Central India on the S. and Rajasthan and the E. Punjab on the W. The area is 106,247 sq. m. The ter. is mostly plain, watered by the Ganges. To the N. a spur of the Himalayas encloses the border of the prov. The climate is hot and rather unhealthy. Wheat, rice, barley, millet, maize, and sugar-cane are grown in considerable quantities. Irrigation by canal is practised. The prin. manufs. are those of sugar, metal, and coarse cotton cloth. Ornamental metal work has long been a notable industry of Benares. There are also leather factories, and tanneries, iron and brass foundries, breweries, oil mills, and lace factories. Engineering is an important industry. Cawnpore (Kanpur) is the chief industrial centre; other important cities are Benares (Banarās), Allahabad, Lucknow (the cap. of Oudh or Avadh), Agra, Meerut, Morabad, Aligarh, Shahjahanpur, Saharanpur, and Jhansi.

Out of the total census of 1941, no fewer than 45,811,700 were Hindus, and only 8,416,300 were Muslims, or 83.3 per cent and 15.3 per cent respectively, the rest being Christians. Hindustānī (or Urdu) and Hindi (E. and W.) are the chief languages.

This ter. was evolved out of various cessions and acquisitions. In 1833 the then Bengal Presidency was divided into two parts, one of which became the Presidency of Agra. Shortly afterwards the Agra area was styled the N.W. Provs. and placed under a Lieut.-Gov. Oudh was annexed in 1856. The two Provs. of Agra and Oudh were placed, in '77, under one administrator, styled Lieut.-Governor of the N.W. Prov. and Chief Commissioner of Oudh. In 1902 the name was changed to 'United Provinces of Agra and Oudh' under a Lieut.-Governor, and the Lieut.-Governorship was made a Governorship in 1921. In 1937 the United Provs. were given an autonomous system of gov., with a Legislative Council and a Legislative Assembly. Pop. (1941) 55,020,000.

**United Society for Christian Literature**, un denominational and international organisation engaged in promoting, publishing, and distributing Christian literature in many parts of the world. It began as the Religious Tract Society in 1799, united with the Christian Literature Society for India and Africa in 1935, and later, committees in London and Scotland associated with the Christian Literature Society for China were included.

**United States Marine Corps**, integral part of the United States Navy, under the control of the Navy Dept. Its members, like those of the Royal Marines (*see* MARINES), on which the U.S.M.C. was originally

modelled, are trained to serve by land and air as well as on the sea, and the corps has distinguished itself in sev. land-actions. The U.S.M.C. was founded in 1775 and is a completely self-contained unit. During the Second World War the corps had its own artillery, tanks, and air force. It took part in the Sp.-Amer. war, the First World War, and in many inter-war operations in China, Mexico, Cuba, etc. In the Second World War, a small force of Amer. marines heroically defended Wake Is. against an overwhelming Jap. attack: in 1942-43 4 divs. of the U.S.M.C. were used in an attack on the Jap.-occupied Solomon and Marshall Is. When S. Korea was invaded by N. Koreans in 1950, part of the U.S.M.C. was sent to help to defend S. Korea on behalf of the United Nations. In Sept. 1950 Amer. marines took part in assault-landings on the Korean coast, and assisted in the capture of Seoul, cap. of S. Korea.

**United States Military Academy**, *see* WEST POINT MILITARY ACADEMY.

**United States of America**, federal republic of 48 sovereign states. Its constitution is written. Each state has a similar fundamental law. The U.S.A. lie roughly between 25° N. and 49° N. lat., and 69° W. and 125° W. long. The boundaries are the Atlantic Ocean on the E., the gulf of Mexico and Mexico on the S., the Pacific Ocean on the W., and the dominion of Canada on the N.

**AREA AND POPULATION**.—The estimated area of the continental U.S.A. is 3,022,387 sq. m., consisting of 2,977,128 sq. m. of land and 45,259 sq. m. of inland water. Non-contiguous ters. of the U.S.A. include the Ter. of Alaska (586,400 sq. m.), the Ter. of the Hawaiian or Sandwich Is. (6,345 sq. m.), and the following dependencies: the Panama Canal Zone (553 sq. m.), Puerto Rico (3,435 sq. m.), Guam (206 sq. m.), the Virgin Is. (133 sq. m.), and Navassa Is. (2 sq. m.), Tutuila and other Is. of E. Samoa, including Swain's Is. (area 76 sq. m. in all), the Wake and Midway Is. (28 sq. m.), and various other Pacific Is., Kure Is., Palmyra, Kingman Reef, Cornwallis or Johnston Is., Howland, Baker, and Jarvis Is. (about 6 sq. m. in all). The Caroline Is. (500 sq. m.) and the Mariana and Marshall Is. (830 sq. m.) are administered under United Nations trusteeship. In addition, two Is. of the Phoenix Group, Canton and Enderbury, are administered jointly by the U.S.A. and Great Britain for common use as air stations. Total area of U.S.A. including ters. and dependencies is 3,620,991 sq. m.

**States and Dependencies**.—Continental U.S.A. comprises forty-eight states and the Dist. of Columbia. Alaska, Hawaii the Panama Canal Zone, Puerto Rico, Guam, Samoa, and the Virgin Is. are also U.S. possessions, and in addition the U.S.A. has the lease of a number of defence bases. The states and dependencies of the U.S.A., together with their pop. and caps. are shown on pages 472 and 473.

**Population**.—According to the census of 1940 the pop. of the U.S. and Territorial

possessions was 134,265,231 (including military forces overseas), an increase of 9,080,257 or 7·3 per cent over the findings of the previous census taken in 1930. An estimated figure of 147,280,000 in Oct. 1948 shows a still further increase, and it is forecast that the pop. will have increased to about 159,000,000 by 1955. According to the 1940 census the pop. of the continental U.S. is divided as follows : white,

118,214,870 (including approx. 1,500,000 Mexicans); negro, 12,865,518; Amer. Indian, 333,969; Chinese, 77,504; Jap. 126,947; other races, 50,467. Discrimination against the Negro is keen in the S., and exists to a lesser extent in most of the N. (*See also* under COLOUR BAR). Of the white pop. 106,795,732 were native born and 11,419,138 foreign born, over 3,000,000 being aliens. Of a permitted

## STATES

State and Abbreviation		Date of Admission to the Union	Gross Area in sq. m.	Census Population 1940	Estimated Population 1948	Capital
Alabama	Ala.	1819	51,609	2,832,961	2,848,000	Montgomery
Arizona	Ariz.	1912	113,956	499,261	664,000	Phoenix
Arkansas	Ark.	1836	53,335	1,949,387	1,925,000	Little Rock
California	Calif.	1850	158,633	6,907,387	10,031,000	Sacramento
Colorado	Colo.	1876	104,207	1,123,296	1,165,000	Denver
Connecticut <sup>1</sup>	Conn.	1788	5,009	1,709,242	2,011,000	Hartford
Delaware <sup>1</sup>	Del.	1787	2,037	266,505	297,000	Dover
Florida	Fla.	1845	58,560	1,897,400	2,356,000	Tallahassee
Georgia <sup>1</sup>	Ga.	1788	58,800	3,123,000	3,128,000	Atlanta
Idaho	Id.	1890	83,557	524,873	530,000	Boise
Illinois	Ill.	1818	56,400	7,897,200	8,670,000	Springfield
Indiana	Ind.	1816	36,291	3,127,700	3,909,000	Indianapolis
Iowa	Ia.	1846	56,280	2,538,268	2,625,000	Des Moines
Kansas	Kans.	1861	82,158	1,800,000	1,968,000	Topeka
Kentucky	Ky.	1792	40,598	2,845,600	2,819,000	Frankfort
Louisiana	La.	1812	48,523	2,368,800	2,576,000	Baton Rouge
Maine	Me.	1820	33,215	817,226	911,000	Augusta
Maryland <sup>1</sup>	Md.	1788	10,577	1,821,244	2,215,000	Annapolis
Massachusetts <sup>1</sup>	Mass.	1788	8,257	4,316,721	4,725,000	Boston
Michigan	Mich.	1837	96,720	5,256,106	6,249,000	Lansing
Minnesota	Minn.	1858	81,068	2,792,300	2,940,000	St. Paul
Mississippi	Miss.	1817	47,716	2,183,796	2,092,000	Jackson
Missouri	Mo.	1821	69,770	3,784,000	3,947,000	Jefferson City
Montana	Mont.	1889	147,100	559,456	511,000	Helena
Nebraska	Nebr.	1867	77,237	1,315,800	1,301,000	Lincoln
Nevada	Nev.	1864	110,510	110,200	142,000	Carson City
New Hampshire	N.H.	1788	9,311	491,500	548,000	Concord
New Jersey <sup>1</sup>	N.J.	1787	7,836	4,160,000	4,729,000	Trenton
New Mexico	N.M.	1912	121,511	531,800	571,000	Santa Fé
New York <sup>1</sup>	N.Y.	1788	19,204	13,479,100	14,386,000	Albany
N. Carolina <sup>1</sup>	N.C.	1789	52,426	3,571,623	3,715,000	Raleigh
N. Dakota	N.D.	1889	70,665	642,000	560,000	Bismarck
Ohio	O.	1803	41,222	6,907,600	7,788,000	Columbus
Oklahoma	Okla.	1907	69,919	2,336,434	2,352,000	Oklahoma City
Oregon	Oreg.	1859	96,980	1,089,684	1,517,000	Salem
Pennsylvania <sup>1</sup>	Pa.	1787	45,339	9,900,180	10,676,000	Harrisburg
Rhode Island <sup>1</sup>	R.I.	1790	1,214	713,346	761,000	Providence
S. Carolina <sup>1</sup>	S.C.	1788	31,055	1,899,000	1,991,000	Columbia
S. Dakota	S.D.	1889	77,017	642,961	623,000	Pierre
Tennessee	Tenn.	1796	42,246	2,915,841	3,149,000	Nashville
Texas	Tex.	1845	263,644	6,414,824	7,230,000	Austin
Utah		1896	84,916	550,310	637,000	Salt Lake City
Vermont	Vt.	1791	9,609	359,231	374,000	Montpelier
Virginia <sup>1</sup>	Va.	1788	40,815	2,677,773	3,029,000	Richmond
Washington	Wash.	1889	68,192	1,736,191	2,187,000	Olympia
W. Virginia	W. Va.	1863	21,181	1,901,974	1,915,000	Charleston
Wisconsin	Wisc.	1848	56,154	3,137,587	3,309,000	Madison
Wyoming	Wyo.	1890	97,914	250,742	275,000	Cheyenne
Dist. of Columbia	D.C.	1790 <sup>2</sup>	69	663,000	898,000	Washington

<sup>1</sup> The original 13 states.<sup>2</sup> Gross area represents land and water.<sup>3</sup> Organised.

## DEPENDENCIES

<i>Dependency, etc.</i>	<i>Date of acquisition</i>	<i>Area</i>	<i>Census Population 1910</i>	<i>Estimated Population 1948</i>	<i>Capital</i>
Alaska	1867 <sup>1</sup>	590,884	60,000	92,000	Juneau
Hawaii (inc. Midway Is.)	1898	6,435	423,330	525,400	Honolulu
Panama Canal Zone	1903	354	51,827	17,500	
Puerto Rico	1898	3,435	1,869,255	2,146,700	San Juan
Guam	1898	205	22,000	24,300	Agaña
Samoa (inc. Swain Is.)	1898 &				
	1925	76	12,908	17,550	Pago Pago
Virgin Islands	1917	132	24,900	27,200	Charlotte Amalie (St. Thomas)
Military and Navy			118,993		

<sup>1</sup> Purchased

quota of 154,000 immigrant aliens, only 92,526 entered the U.S. on quota in 1947-8, and 78,044 non-quota aliens, making a total of 170,570. (See also EMIGRATION; IMMIGRATION.)

*Cities.*—In 1949 it was estimated that 99 cities in the U.S.A. had a pop. of over 100,000. Those with a pop. over 450,000 are listed below. The figure given in brackets denotes the pop. in 1880.

New York, N.Y.	8,160,000	(1,911,700)
Chicago, Ill.	3,750,000	(503,200)
Philadelphia, Pa.	2,100,000	(847,200)
Detroit, Mich.	1,623,500	(116,200)
Los Angeles, Calif.	1,504,300	(11,200)
St. Louis, Mo.	902,000	(350,500)
Cleveland, O.	878,300	(160,100)
Baltimore, Md.	859,100	(332,300)
Boston, Mass.	770,800	(362,800)
Pittsburgh, Pa.	671,700	(235,000)
Washington, D.C.	663,000	(147,300)
San Francisco, Calif.	634,600	(234,000)
Milwaukee, Wisc.	587,500	(115,600)
Buffalo, N.Y.	575,900	(155,100)
Minneapolis, Minn.	550,000	(46,900)
Houston, Tex.	495,000	(16,500)
New Orleans, La.	494,500	(216,000)
Dallas, Tex.	478,000	(10,40)
Seattle, Wash.	476,000	(3,500)
Cincinnati, O.	455,600	(255,100)

*GEOGRAPHY. Surface.*—The surface of the U.S.A. from E. to W. may be divided as follows: (1) The Atlantic Plain, which extends from the coast to the Appalachian system (formerly called the Alleghianes) (2) The Mississippi Valley and Great Central Plain, which extends from the Appalachian Mts. W. to the Rocky Mts., an enormously fertile region about 1000 m. by 1000 m. in extent. (3) The W. Highlands. (4) The Pacific Slope, which extends from the Rocky Mts. to the Pacific Ocean.

*Mountains.*—The chief int. systems are the Appalachian ranges in the E. and the Rocky Mts. in the W.

(1) The Appalachian system consists of very anc. rocks, which were elevated in former ages to a great height, and then reduced by erosive forces to a broad lowland. More recent elevation is responsible for some of the present ranges, while others are remainders of the earlier move-

ments which have restricted erosive forces. The surface of this region to-day is a series of parallel ranges divided by fertile valleys.

(2) The Rocky Mt. system is composed of comparatively recent formations, and in some parts elevation still continues. Many of the ranges are anticlinal, and many peaks rise to great heights. Volcanoes or extinct volcanoes are numerous. The U.S. Rocky Mt. system extends from 29° N. to 49° N. lat., a distance of about 2000 m. The system is continued in Canada. The highest peaks are Mts. Harvard and Lincoln, both over 14,000 ft. In the W. part of the S. Rockies lies the Great Basin of Colorado, with the Wasatch Mts. on the E., and the Sierra Nevada on the W. This basin is extremely arid, has suffered much volcanic action, and is intersected by deep cañons cut by the rivs.

The W. of the highland region of the western U.S.A. is bounded by the Pacific Mts. These consist of three ranges, the Sierra Nevada, the Cascade Range, and the Coast Range.

*Coast.*—The E. coast of the U.S.A. continues the Continental Shelf of Canada. This shelf was at one period in the geological hist. of the country completely uncovered, and at another period the whole of the present coastal plain, as well as the present Continental Shelf, was submerged. The Continental Shelf practically disappears off Florida.

The riv. valleys which cross the coastal plain and the Continental Shelf are now partially submerged, and so give safe and deep harbours. From the N. boundary of the U.S.A., as far S. as Cape Hatteras, the coast is low and, especially N. of New York State, rocky, the coast of Maine eminently so. The coast of New Jersey, on the other hand, is sandy, and, farther S., off the Atlantic coast and also along parts of the coast of the gulf of Mexico, there are numerous sand-spits with shallow channels, lagoons, and swamps. There are few good natural harbours here.

There is only one considerable indentation on the E. coast of the U.S.A., viz. Chesapeake Bay, which runs inland in a



A COTTON WORKER  
OF GEORGIA



AN INDIAN OF TAOS,  
NEW MEXICO



STEEL WORKER  
OF PENNSYLVANIA

*U.S. Information Service*

northward direction for more than 180 m., with an average breadth of about 15 m.

The Pacific coast of the U.S.A. has a very narrow Continental Shelf, and few bays or capes. The only considerable indentations are San Francisco harbour, which is deep and safe, and Puget Sound, between the State of Washington and British Columbia.

**Rivers.**—The rivs. of the Atlantic Plain rise in the Appalachian system, and are comparatively short. In some cases they are too rapid to be of much value for navigation, but are valuable as supplying water power. The others almost without exception have good harbours at their mouths. The Hudson is the most valuable for commerce, as it is connected by the Erie Canal with Buffalo and the connects it with Montreal.

The Great Central Plain is drained by the Mississippi-Missouri riv. system, the basin of which covers half the area of the U.S.A., and is equal in area to about one-third the area of Europe. The Mississippi rises in Lake Itasca in Minnesota, at about 1500 ft. above sea-level. After flowing for about 100 m. in an easterly direction it turns S., and is joined by numerous tribe. The chief is the Missouri, which enters the Mississippi just above St. Louis.

The Mississippi-Missouri has made a broad flood plain, varying in width from 30 to 60 m. This plain is subject to severe inundations, for it slopes very gently away from the riv. bed, which is in many parts of the riv. above the level of the surrounding plain contained by levees maintained by the gov. When these break great floods occur. The riv. carries a vast amount of silt, which it deposits at its mouth, forming a delta.

Other rivs. falling into the gulf of Mexico are the Mobile and the Rio Grande. The latter (about 1650 m. long) forms the boundary between Texas and Mexico.

The rivs. flowing into the Pacific are comparatively short, owing to the near-

ness of the coast ranges to the sea. The Colorado R., 2000 m. long, flows into the gulf of California, after crossing an arid plateau. It has cut for itself a deep cañon with almost perpendicular banks, in many places more than a mile high. The San Joaquin and the Sacramento Rs. unite and flow into the harbour of San Francisco; these and the Columbia, 1400 m. long, are the only important rivs. on the W. of the U.S.A.

**Lakes.**—Of the Great Lakes of N. America Lake Michigan lies within the U.S.A., and the S. shores of Lake Ontario, Lake Erie, Lake Huron, and Lake Superior are U.S. ter. These lakes were formed by the action of the glacier which once covered the continent as far S. as the forty-second parallel, roughly speaking. They are remainders of much larger lakes and are of the utmost importance as waterways. They comprise the greatest inland body of fresh water in the world and carry ships comparable to those of the ocean. New England has very many smaller lakes which are also the result of glacial action. The largest lake of the U.S.A., apart from the Great Lakes, is the Great Salt Lake of Utah.

**Climate.**—A country as large as the U.S.A. and one having so wide differences of elevation must necessarily have a climate of wide differences of temp. and of rainfall. The S.E. States have almost a sub-tropical climate, without extreme variation between the winter and summer temps. The E. and central states are subject to much greater variations of temp., while the W. coast is less extreme in climate than are the other parts of the U.S.A. The rainfall is heaviest in Alabama, Mississippi, Gulf States, and on the E. coast; it gradually decreases towards the W.; California and Colorado are dry, and the N. part of the W. coast has an abundant rainfall. The driest states are Arizona, Nevada, Montana, and New Mexico. The rainfall of the E. coast is steady and rather greater than that



A FARMER OF  
OREGON



A SUPERINTENDENT OF  
SCHOOLS, NEW YORK



A MERCHANT-SEAMAN  
OF NEW YORK

*American Embassy, London*

of England. The rainfall in the Gulf States is heavier and is chiefly monsoonal in character, falling mainly in the summer. The winds from the Pacific bring rain to the W. coast, but the Sierra Nevada Mts. shut these winds off from the Great Basin in Nevada and Utah, which has an average yearly rainfall of less than 10 in. The climate of the Central Plain is rendered colder in winter owing to lack of shelter from the winds blowing from the N. The Central Plain and the New England States have heavy snowfalls in winter, while perpetual snow lies on the summits of the Rockies and of the Coast Ranges.

*Flora and Fauna.*—In their natural state the E. coastal plain and the E. highlands were covered with temperate forests. These have been largely cut down. The S. States (the Gulf States) have some sub-tropical forest trees which yield woods valuable in commerce. The W. coast forests are extensive, and are noted for the enormous size of some of their trees, which are mainly spruce, cedar, redwood, and Sequoia pine. The Central Plain was originally covered on the E. with mixed forest and grass-lands, which merged into grass lands without forests to the W. as the rainfall decreased. This dist. is now the great wheat and grass area. The Great Basin region has not much vegetation; what there is is mainly of a desert type, though where irrigation works have been successfully carried out this region has proved itself capable of supporting a luxuriant vegetation.

The Central Plains of the U.S.A. were once the haunt of the bison, but it is now almost exterminated, though herds are still preserved in the Yellowstone dist. Other indigenous animals are the grizzly bear, which belongs to the Rockies, the Rocky Mt. goat, the Rocky Mt. sheep, the opossum, the prairie dog, the puma, the wild cat, coyote, and various kinds of deer. The fish include cod, halibut, mackerel, shad, and salmon. Many

varieties of fresh-water fish are found in the lakes. The country is also noted for its great variety of bird life.

*MINERALS.*—The U.S.A. is rich in almost every kind of mineral. There are seven main coalfields supplying bituminous coal. These are: the Appalachian, the Central, the W., the Rocky Mt., the Michigan, the Richmond Basin, and the Pacific coast fields. The only important source of anthracite coal is Pennsylvania. The most productive iron mines are in the neighbourhood of Lake Superior; the most valuable mines apart from these are in the S. Appalachian region. The Lake Superior dist. is rich also in copper, which is found almost in its pure state. Copper is also found in Arizona, Utah, Montana, and New Mexico. The E. States are rich also in petroleum and in natural gas. Pennsylvania is the largest producer of these commodities in the E., but there have been enormous finds in Texas, Oklahoma, and California. Zinc is found principally in Idaho, Oklahoma, New Jersey, and Kansas. The precious metals are mined principally in California, Colorado, Idaho, S. Dakota, Utah, Montana, Arizona, and Alaska. Large supplies of kaolin are found in the E. States; some sulphur is mined in Nevada and Utah. Salt is produced commercially in a number of States, especially Michigan, New York, Ohio, and Louisiana. Considerable quantities of marble are quarried in Vermont; sandstone is found in Ohio, Pennsylvania, Connecticut, and New York.

Gold production was as high as 6,000,000 troy oz. in 1940 (value 210,000,000 dollars), and thereafter declined steadily to under one million troy oz. in 1945; in 1946 it rose to 1,462,354 troy oz. (value 51,000,000 dollars), and in 1947 to 2,165,318 troy oz. (value 76,000,000 dollars). Silver production had a peak year in 1911 with over 71,000,000 troy oz. (value 25,000,000 dollars); thereafter average ann. production up to 1947 was 37,000,000 troy oz. (value 23,000,000

dollars). The platinum group of metals (platinum, palladium, ruthenium, iridium, rhodium, osmium) are produced mainly from placers but also as a by-product of copper refining. Their ann. value in recent years is about one million dollars. Production in a peak year (1938) was 45,000 troy oz., but in 1947 it had declined to 17,000 troy oz. Apart from the precious metals, the average figures for the ann. production (in short tons, i.e. of 2000 lb.) and value (in millions of dollars) of other non-ferrous metals over the ten years 1937-46 are as follows: copper, 855,000 (value 210); zinc, 545,000 (value 81); lead, 430,000 (value 57). In 1947 production of copper was 863,000 short tons (value 361,000,000 dollars); zinc, 510,000 (value 109); lead, 381,000 (value 109). Estimated figures for 1948 showed a decline in output of copper (846,000 short tons), zinc (190,000 short tons), and lead (352,000 short tons). Other important non-ferrous metals (with 1948 production) are aluminium (627,000 short tons), antimony (5000 short tons), nickel (700 short tons), molybdenum (27,000,000 lb.), magnesium 25,000,000 lb.), and mercury (about) 1,000,000 lb.). Iron ore is abundant in a number of States, particularly Minnesota, Michigan, and Alabama. It is estimated, however, that at the present (1949) rate of production there may be a shortage in ten or twenty years, especially of the high-grade ores produced in Minnesota. Total output of iron ore was 71,000,000 long tons in 1946 and 93,000,000 long tons in 1947. Average production of pig iron over ten years 1937-46 was 49,000,000 short tons and of steel 65,000,000 short tons. In 1947 production of pig iron rose to 59,000,000 and in 1948 to 61,000,000 short tons. Steel production showed a greater increase with 85,000,000 short tons in 1947 and 88,500,000 short tons in 1948, estimated output for 1949 being 92,000,000. Of the non-metallic mineral products, petroleum is produced in twenty-six States, the chief being Texas (over 800,000,000 barrels annually), California (390,000,000), Louisiana (150,000,000), Oklahoma (140,000,000), and Kansas (100,000,000). Petroleum has been produced since 1849, total production being 37,095,030,000 barrels (of 42 gals.) of crude oil, 1,706,000,000 barrels of natural gas (liquid), and 100,130,000,000 cu. ft. of natural gas. Average ann. production during ten years (1938-47) was: crude oil, 1,491,000,000 barrels; natural gas (liquid), 93,000,000 barrels; natural gas, 4,780,000,000 cu. ft. The year 1948 was one of greatly increased activity; 4000 new wells were put into production, bringing the total of wells producing up to 435,000. It was a record year for crude oil production, 2,012,000,000 barrels at a value of over 5,000,000 dollars. In the same year production of natural gas was: liquid, 143,000,000 barrels; gas, 7,400,000,000 cu. ft. In addition to this vast domestic production, imports of crude oil, mainly from Venezuela and Persia, amounted

to 11,600,000 barrels in 1948 at a value of 25,000,000 dollars. The Philadelphia area is the chief refining centre, and the port of Philadelphia is the port of entry for crude oil imported from abroad. As a result of expansion in 1948, refineries are now able to cope with the domestic demand for petrol, kerosene, and light and heavy fuel oils. Coal production during the ten years (1937-46) showed the following average per year in millions of short tons (value in millions of dollars): anthracite, 56 (value 260); bituminous, 507 (value 1265). In 1947 production was: anthracite, 57 (value 413); bituminous, 619 (value 2562). Estimated production for 1948 was 57,052,000 short tons of anthracite and 594,000,000 short tons of bituminous. Coke production averages at over 610,000,000 short tons (value 506,000,000 dollars).

The values in millions of dollars of combined mineral products are as follows: The total average ann. value during ten years (1937-46) was 6825; in 1947 value was 12,315; in 1948 value was 13,870. Divided between metallic products, fuels (i.e. coal, petroleum, natural gas, and liquid natural gas and allied products), and non-metallic (excluding fuels), the ann. values are as follows: (average 1937-46) metallic 1845, fuels 4050, other non-metallic 930; (1947) metallic 2915, fuels 7800; other non-metallic, 1600; (1948) metallic 3690; fuels, 8430; other non-metallic 1750.

AGRICULTURE.—A census taken in 1945 showed that nearly 60 per cent of the total land area of the continental U.S. is farmed, i.e. 1,141,615,000 ac., comprising 5,859,000 farms. The number of farms has decreased since 1930, but the acreage farmed has grown from 968,771,000 ac. in 1930 to 1,141,615,000 ac. in 1945. Since 1930 output has increased by about a quarter as the result of improved farming methods, but the long-term fertility of the soil may have been impaired. The value of farm lands and buildings has fluctuated, being (in millions of dollars) 48 in 1930, 34 in 1940, and 46 in 1945. In 1947 it was estimated that 27,550,000 people were engaged in farming in the U.S.A. (31,614,269 in 1900). Agriculture is still, however, the largest single industry in America, employing 17.6 per cent of the working pop. Wheat, oats, barley, and maize are the chief cereals grown. Wheat is grown chiefly in Washington, Minnesota, Indiana, North and South Dakota, Ohio, and Oregon. Oats and barley are grown also in California. Maize is largely grown for fattening cattle, chiefly in Kansas, Nebraska, Iowa, Illinois, Missouri, Indiana, and Ohio. Rice is grown in the swampy parts of Louisiana and Texas. Tobacco is grown principally in Kentucky, S. Carolina, N. Carolina, Virginia, Georgia, and Tennessee. Sugar is grown in Louisiana, but beet sugar also is manufactured from beets grown in Michigan, Nebraska, Colorado, Utah, and California. Cotton is very largely grown in the S.E. part of the country. There are two kinds, the sea-island cotton, which



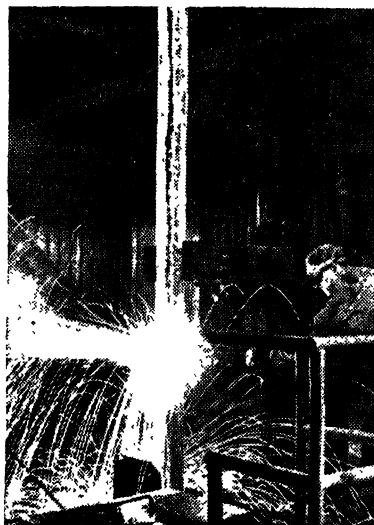
has a long thread and is grown on the is. and coasts of Georgia, S. Carolina, and Florida, and the 'upland' cotton, which has a short thread. This is grown inland in the S.E. States. The production in 1947 was nearly 11,694,000 bales of 500 lb. each. The leading cotton state was Texas; others were Mississippi, Arkansas, Alabama, California, Georgia, S. Carolina, among a total of 19 cotton states. Flax is grown mainly for its seed. The chief centre for it is Minnesota. The average ann. production during ten years (1938-47) of the prin. crops is as follows (in millions of bushels): corn (maize), 2790; oats, 1220; wheat, 101; potatoes, 394; barley, 305; soya beans 148; sorghums, 102; rice, 63; rye, 35; flax seed, 30; buckwheat, 7. Average ann. production of cotton over the same period was 11,000,000 bales, and of cotton-seed 5,000,000 short tons. Tobacco production averages over 1,700,000,000 tons a year. Over 100,000,000 tons of cultivated hay is cut each year. Fruit and nuts form a large part of the ann. produce; average figures during ten years (1938-47) for the chief fruits are (in millions): apples, 113 bushels; peaches, 70 bushels; pears, 31 bushels; grapes, 3 tons; oranges, 100 boxes; grapefruit, 50 boxes; lemons, 13 boxes; strawberries, 9 crates. During the same period average production of sugar-cane was 6,000,000 short tons, from which about half a million short tons of sugar are produced. Sugar-beet averages about 10,000,000 short tons a year, of which about one-sixth is converted to sugar.

**Stock Farming.**—A census taken in 1940 showed there were 10,444,000 horses, 4,034,000 mules, 68,309,000 cattle (excluding milch cows), 24,940,000 milch cows, 42,666,000 sheep, and 61,165,000 pigs. Estimate for 1948 showed a decline in numbers of stock except cattle. Figures (with value in millions of dollars) were 6,607,000 horses (value 366); 2,544,000 mules (value 338), 78,564,000 cattle (all kinds, excluding milch cows (value 9,150), 25,165,000 milch cows (value 4,126), 35,332,000 sheep (value 458), 55,038,000 pigs (value 2,356). Poultry on farms number some 463,000,000, and ann. egg production is about 56,000,000,000.

**Forestry.**—An estimate made in 1945 showed that forest land occupied about 624,000,000 ac., or about one-third of the area of the continental U.S. Of this forest area, 461,044,000 ac. represented commercial forest, comprising sawtimber areas 205,176,000 ac. of second or older growth, pole-timber areas 95,013,000 ac., seedling and sapling areas 85,552,000 ac., and areas poorly stocked or denuded 75,303,000 ac. Of the commercial forests the Federal Gov. owned 88,957,000 ac., State, co., or city 27,114,000 ac., and private companies 344,973,000 ac. The national Forest Service, however, administers both commercial and non-commercial forest land, divided into 152 national forests in 40 States and in Alaska and Puerto Rico, the total extent (1948) being nearly 180,000,000 ac. The W. and S. States supply Douglas and White fir,

redwood, ponderosa and sugar pine, hemlock, and spruce; the E. States, yellow and white pine, oak, red gum, yellow poplar, maple, hemlock, beech, and cypress. Ann. production of timber is over 30,000,000,000 board feet. By-products from forestry include turpentine, tar, resin, and molasses made from wood sugar for poultry food.

**MANUFACTURES AND INDUSTRY.**—Industrial production in the years since the Second World War is nearly a hundred per cent higher than in 1938-39. The following figures, in millions of dollars, are for 1948. The chief durable manufs. are iron and steel (8653), machinery other than electrical (6896), electrical machinery (3609), transportation equipment other than automobile (1900), automobiles and equipment (4151), non-ferrous metals and their products (2264), timber and lumber products (4309), stone, clay, and glass products (2174). Non-durable manufs. include textiles (9207), chemical products (4640), rubber



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#### THE STEEL INDUSTRY

Cutting the moving steel bar at the first continuous casting tower in Beaver Falls, Pennsylvania. The oval bar, emerging from the mould, is cut into 15 ft lengths by an automatic acetylene cutting torch.

products (1052), petroleum and coal products (3228), food and kindred products (6926), tobacco (387), paper and allied products (2457), printing and publishing (3229), and leather products (1304). Industry is widespread, the chief manufacturing centres being New

York, Newark, and New Jersey, Chicago, Detroit (centre of the motor-industry), Philadelphia and Camden, Pittsburgh, Boston, Cleveland, Buffalo, St. Louis, Los Angeles, San Francisco, and Oakland, Baltimore, Milwaukee, Cincinnati, Youngstown, Bridgeport, New Haven, and Waterbury. The chief iron manufs. are in Pennsylvania, Allegheny co. being the most important dist., and Pittsburgh the most important tn. This state manufs. mainly steel for bridges, frames of buildings, rolled steel, nails, etc. Tools and cutlery are manufactured in the New England States, agric. implements in Illinois and Connecticut. Machinery is largely made in Chicago, New York, Pittsburgh, Philadelphia, and Cleveland. Steel ship-building goes on at Philadelphia, San Francisco, and other ports. Cottons are manufactured, mainly on the E. Coastal Plain. The atmosphere is here sufficiently damp for the thread, and the line of falls by which the rivs. descend from the Appalachian hills to the plain supplies abundant water power for the working of the machinery. The S. States, particularly N. Carolina, have begun the manuf. of cotton textiles and are displacing New England in this regard. Woollens are manufactured mainly in the New England States, and in Philadelphia and New York. The manufs. include men's suitings, women's dress goods, carpets, and felts. Silk is manufactured in New Jersey, New York, and Pennsylvania. Food manufs. and industries are important. They include the preparation of cattle, sheep, and pigs for export. Chicago, Omaha, and Kansas City are the

largest centres for this industry; from it arises the leather-making industry, whose chief dists. are New York, Philadelphia, and Worcester in Massachusetts. Flour milling is carried on mainly at Minneapolis, St. Paul, and at Superior. Fruit and salmon are canned very largely on the Pacific coast. Other important manufs. are glassware, silverware, and hardware, asbestos products, druggist preparations and patent medicines, perfume and cosmetics, cigarettes, musical instruments, and fertilisers.

The preliminary report issued after the census of 1947 gave the first figures for the conditions of manufacturing industries in the U.S.A. since 1939. In 1939, there were 184,230 establs., with 7,886,657 employees. In 1947 there were 240,881 establs., with 14,294,304 employees. Distribution of these numbers among the major industries was also shown. The table below shows statistics of major U.S. manufactures according to the Census of 1947.

To meet the high cost of living, wages and salaries, by European standards, are generally high. Amer. labour is organised into unions which, unlike most European bodies, accept in principle the capitalist basis of society.

Since the 1880's, Amer. industries have been increasingly dominated by large corporations.

Amer. industry relies to a large extent on electricity. In 1947 industries produced 51,023,000,000 kWh for their own use, apart from 255,725,000,000 kWh for sale. Of this joint total 83,057,000,000 (over 27 per cent) was hydro-electric.

#### MANUFACTURES IN THE U.S.A.

*as listed in the preliminary report of the U.S. Bureau of the Census.*

Industry	Number of establishments	Employees (average for a year)
Food and kindred products .. .. .	39,933	1,441,847
Tobacco manufactures .. .. .	1,086	111,782
Textile mill products .. .. .	8,185	1,233,431
Apparel and related products .. .. .	30,960	1,081,844
Lumber and products (except furniture) .. .. .	26,231	635,708
Furniture and fixtures .. .. .	7,687	322,384
Printing and publishing industries .. .. .	28,086	715,450
Paper and allied products .. .. .	4,103	449,833
Chemicals and allied products .. .. .	10,073	632,319
Petroleum and coal products .. .. .	1,387	212,003
Rubber products .. .. .	875	259,092
Leather and leather products .. .. .	5,308	383,175
Stone, glass, and clay products .. .. .	11,650	462,072
Primary metal industries .. .. .	5,363	1,137,124
Fabricated metal products .. .. .	16,734	971,461
Machinery (except electrical) .. .. .	17,906	1,545,323
Electrical machinery .. .. .	3,973	801,359
Transportation equipment .. .. .	3,711	1,181,680
Instrument and related products .. .. .	2,599	231,997
Miscellaneous manufactures .. .. .	14,131	464,420
<b>TOTAL ALL INDUSTRIES ..</b>	<b>240,881</b>	<b>14,294,304</b>

**COMMERCE.**—The extent of internal trade is shown by the fact that retail sales amounted on an average during 1948 and 1949 to over 10,000,000,000 dollars per month, and wholesale sales to over 5,000,000,000 dollars per month. External trade has shown an excess of exports over imports since 1880. The prin. countries to which U.S. goods are exported are (in order of value of trade): Canada, the United Kingdom, France, Argentine, Brazil, Mexico, Germany, Belgium, and Luxembourg. Those from which goods are imported are (in the order of value of trade): Canada, Cuba, Brazil, Brit. Malaya, India, Mexico, and the United Kingdom. As regards trade between the U.S. and the United Kingdom, the average ann. value of U.S. exports to the United Kingdom during the three years 1945-47 was \$282,503,000, and the value in 1948 and 1949 was \$184,438,000 and \$693,513,690 respectively. The average ann. value of U.S. imports from United Kingdom during the three years 1945-47 was \$34,024,000, and the value in 1948 and 1949 was \$60,158,000 and \$226,203,287 respectively.

During the three years 1946-48 the average ann. value (in millions of dollars) of exports, divided into economic classes with the average ann. value of the chief commodities in each class (and quantity shown in brackets) was as follows:—crude materials, 1500, including coal, 470 (50,000,000 tons), cotton, 470 (1,600,000,000 lb.), tobacco, 280 (520,000,000 lb.), petroleum, 100 (40,000,000 barrels); crude and manufactured foodstuffs, 2600, including wheat and flour, 1100 (440,000,000 bushels), fruit and vegetables, 300, dairy products and eggs, 360, meats and edible fats, 280 (1,000,000,000 lb.); semi-manufs. and finished manufs., 1300 and 6900 respectively, the chief commodities being electrical, industrial, and agric. machinery, 2000; automobiles including parts and accessories, 840 (including 197,000 passenger motor cars and 215,000 trucks and coaches); chemicals and related products, 690; iron and steel-mill products including scrap, 640 (5,000,000 tons); petroleum products, 480 (including 34,000,000 barrels of petrol and 13,000,000 barrels of lubricating oil); merchant vessels, 340 (1400 vessels).

During the three years 1946-48 the average ann. value (in millions of dollars) of imports, divided into economic classes with the average ann. value of the chief commodities in each class (and quantity shown in brackets) was as follows:—crude materials, 1840, including rubber, 280 (1,300,000,000 lb.), wool, 270 (832,000,000 lb.), petroleum, 180 (70,000,000 barrels), undressed furs, 170, non-ferrous ores, 140, oilseeds, 110 (1,100,000,000 lb.), hides and skins, 90 (220,000,000 lb.), tobacco, 85 (85,000,000 lb.), raw silk, 45 (7,000,000 lb.); foodstuffs, crude and manufactured, 1650, including coffee, 580 (2,600,000,000 lb.), cane sugar, 310 (6,700,000,000 lb.), fruit, nuts, and vegetables, 200, cocoa or cacao beans, 130 (580,000,000 lb.), fish, 95

(450,000,000 lb.), wines and spirits, 80; semi-manufs., 1260, including non-ferrous metals, 370, wood pulp, 220 (2,000,000 short tons), fuel oil, 90 (80,000,000 barrels), vegetable oils, 85 (320,000,000 lb.), diamonds, 40 (450,000 carats); finished manufs., 1000, including paper and newsprint, 350, burlaps, 105 (550,000,000 lb.), timepieces, 180, textiles, 105, passenger automobiles, 10 (10,000 motor cars).

**External Trade in the United States of America.**—The following table shows value in millions of dollars for selected years:

Year	Exports	Imports
1840	111	98
1860	316	353
1880	823	667
1900	1,370	849
1910	1,710	1,556
1920	8,228	5,278
1930	3,843	3,061
1932	1,611	1,323
1939	3,117	2,318
1941	5,147	3,345
1943	12,965	3,381
1944	14,259	3,919
1945	9,803	4,136
1946	9,739	4,909
1947	15,338	5,733
1948	12,663	8,058
1949	12,000	6,626

**COMMUNICATIONS. Shipping.**—The tonnage of vessels entered and cleared at U.S. ports each year is about 190,000,000 net tons, of which over 100,000,000 represents Amer. shipping. New York is the chief seaport, over 40,000 tons of shipping being entered and cleared annually and over 100,000,000 tons of cargo handled. Other important ports on the N. Atlantic coast are Philadelphia, Boston, Portland, Providence, and Bridgeport; total tonnage entered and cleared annually, 12,000 tons. On the S. Atlantic coast the chief ports are Norfolk, Baltimore, Charleston, and Savannah; total tonnage, 41,000 tons. On the Mexican Gulf the chief ports are New Orleans, Galveston, Tampa, Mobile, and Port Arthur; total tonnage, 35,000 tons. On the Pacific coast the chief ports are Los Angeles, San Francisco, Seattle, Portland, and San Diego; total tonnage, 21,000 tons. Of the Great Lakes ports, Duluth (at which over 50,000,000 tons of cargo are handled annually), Toledo, Chicago, and Cleveland are the chief. Another important port is Houston, Texas, the Houston Ship Channel, 50 m. long and 30 ft. deep having been completed in 1925. Houston ranks as the fourth seaport after New York, Philadelphia, and Baltimore, over 30,000,000 tons of cargo being handled annually at each of these ports. Excluding vessels on the Great Lakes and inland waterways, the U.S. merchant marine comprised (1949) approximately 3500 sea-going ships of 1000 gross tons or over, aggregate deadweight tonnage being about 37,000,000.

**Road, Rail, and Air Transport.**—Road mileage outside urb. areas is estimated (1947) at 3,009,145 m., of which 71,730 m. are under Federal control, 549,873

under State control, and 2,387,542 under local control. Under the Federal Aid Highway Act of 1948, increased Federal aid was given to a system of primary roads extending over 232,000 m. This included the National Inter-State Highway system covering over 40,000 m., consisting of about 37,000 m. of main rural roads, the remainder being urb. and by-pass roads. The secondary road system receiving Federal aid extended over 378,000 m. (1949), new construction during 1948 amounting to some 27,000 m. A section of the Pan-Amer. Highway, to which the U.S., Mexican, and Central Amer. govs. contribute, runs through the U.S. from Nuevo Laredo on the Mexican border to Panama City, about 3,260 m. The Highway Act of 1948 authorised an ann. expenditure of 450,000,000 dollars on road development.

The first railway projected was to run from Baltimore linking the coast with the Ohio valley (1831). In succeeding years a number of railways came into existence over short distances between neighbouring tns. By Act of Congress, the Union Pacific Railroad (*q.v.*) was chartered in 1862. By the end of the century about 167,000 m. of railway were in operation. The mileage has since been increased to over 227,000 m. (1949). During 1918 and 1919 considerable capital improvement was carried out, involving an ann. expenditure of over 1,000,000,000 dollars. 1917 was a record year for the value of freight traffic with a tonnage of 1,613,000,000, carried over 657,878,000,000 ton-m. In that year also 706,000,000 passengers were carried over 46,000,000,000 passenger-m. In succeeding years there has been a slight decline both in passenger and freight traffic as a result of increased competition from other forms of transport.

Air transport over continental U.S. is conducted by twenty-nine companies, of which sixteen operate trunk lines and the remainder feeder lines. Of these sixteen companies, nine also operate overseas and international lines, while there are a further four companies operating overseas and international lines only. On the domestic airlines over 300,000,000 m. are flown annually with over 13,000,000 passengers (passenger-m. (1948) being estimated at 5,900,000,000), and on the overseas and international lines some 90,000,000 m. with over 1,000,000 passengers (passenger-m., 1,900,000,000). The commercial airlines have (1949) over 1000 aircraft in commission. The number of airports is (1949), 6337, *i.e.* commercial, 2991; municipal, 2619; international (maintained by Civil Aeronautics Administration), 161; military, 399; all other, 767.

**Telegraphs and telephones.**—These are controlled by private companies, the former largely by Western Union Telegraph with nearly 30,000 offices, and the latter by American Telephone and Telegraph, which has organised the Bell Telephone System, operating over 30,000,000 telephones out of a total of 38,000,000 for all systems. Post-offices

number 41,695 (1949), of which 2323 are Class I. Air mail is carried over 33 domestic and overseas airlines, over 30,000,000 ton-miles being flown annually. The two chief cable companies are the W. Union and Commercial Cable, both of which also own cable lines to Europe.

**RELIGION.** The religious census taken in 1936 showed that there were in the U.S., 256 religious bodies with 199,302 churches and a total membership of 55,807,366. In 1948 it was estimated that the continental U.S. contained 242 religious bodies with 265,583 churches and a membership of 81,777,874. Of the various Protestant denominations those with over 1,000,000 membership were: Baptists, 15,464,718; Methodists, 10,492,029; Lutherans, 5,715,087; Presbyterians, 3,349,073; Protestant Episcopalians, 2,378,000; Disciples of Christ, 1,872,049; Congregational Christian Church, 1,184,661; Latter-Day Saints, 1,184,595. Other Protestant bodies included the Evangelical Reformed Church, 714,583; Church of Christ, Scientist, 269,000; and the Evangelical United Brethren, 786,842. The Roman Catholic Church



U.S. Information Service; American Embassy

BOSTON, MASSACHUSETTS: WASHINGTON STREET

The Old South Church (centre) was built in 1730, a hundred years after the founding of the city.

was the largest single church, with 26,718,343 members; the Eastern Orthodox Church had 711,287 members. There were 5,000,000 Jews.

**EDUCATION.**—Illiteracy among the pop. aged fourteen or over decreased from 3·1

per cent in 1940 to 2.7 per cent in 1947. Illiteracy is higher among the non-white pop., being 41 per cent (1947), among non-white aged fourteen or over and 32.4 per cent among non-white aged sixty-five or over. Each State has its own laws for compulsory school attendance up to age fourteen or sixteen, and exercises control in conjunction with the local authorities. According to the census in 1940, nearly fifty-one per cent of the pop. between the ages of five and twenty-four was attending school, college, or other educational institution, numbering 26,759,099 persons. There are nearly 200,000 elementary and secondary schools, including 24,000 public high schools. Many higher educational institutions receive State grants and most are run on the basis of co-education. There are (1949) some 850 univs. and senior colleges and over 900 professional, technological, and other higher educational institutions, embracing in all over two million students of both sexes and about 100,000 teachers. Harvard and Yale bear most similarity to Oxford and Cambridge on which they are consciously modelled to some extent. Among the most famous colleges for women are Wellesley and Smith. Most Amer. univs., however, are co-educational.

#### FEDERAL CONSTITUTION AND STATE GOVERNMENTS.—

The Federal Constitution of the U.S.A. came into being on Sept 17, 1787. Its framers used their experience or knowledge of the working of the Eng. constitution, and adopted both the spirit and machinery of that constitution. The Amer. constitution contains seven original and twenty-one amending articles, and entrusts the gov. of the nation to three separate authorities: the Legislature, the Executive, and the Judiciary. Article I. vests the legislative power in a Congress consisting of a Senate and a House of Representatives composed of two members for each State elected for six year terms (elected biennially according to the electoral laws of the different States), and prescribes the qualifications of senators and representatives. The representatives are chosen every second year by the electors of the different States, while two senators chosen by the electors represent each State for a term of six years, one third of the senators being elected every two years. As in the case of the Eng. Parliament each House determines the rules of its proceedings, adjudges disputed elections, and punishes members for misconduct. A Bill becomes law on passing both houses provided the president approves and signs it. If he returns the Bill, which he may do, with his objections, the House of origination may proceed to reconsider it, and, if on reconsideration, two-thirds of that House agree to pass the Bill, they may send it to the other House, together with the president's objections; if approved by two-thirds of that House it becomes law. A Bill not returned by the president within ten days after presentation automatically becomes law, unless Congress, by adjourning, prevent its

return. The president has the power, with the advice and consent of the Senate, to make treaties, provided two-thirds of the senators present concur. All revenue Bills must originate in the House of Representatives, but the Senate may propose or concur with amendments. Congress must assemble at least once annually. The vice-president, who holds office for four years is *ex officio* president of the Senate, but only votes on an equality of division. He becomes president, in case of the death or resignation of the latter, for the unexpired portion of the presidential term. Section 8 of Article I., which specifies the powers of Congress, is the vital part of the constitution. Beyond those powers Congress may not go, and the courts are made the ultimate arbiters on the constitutionality or otherwise of any law of Congress. (See CONGRESS.)

By the amending articles XIV. and XV., additional powers are given for the protection of citizens against unjust or discriminating legislation by any State. The prin. remaining clauses of Article I. forbid the grant of titles of nobility, and prohibit any State from making treaties or exercising other powers vested in Congress, or from passing *ex post facto* (or retro-active) laws.

Executive power is vested by Article II. in the president, who holds office for four years. He is elected by the Electoral College, the members of whom are appointed by each State in numbers equal to the number of representatives and senators returned to Congress by the State. No person except a natural-born citizen is eligible as president nor is any one eligible unless he be at least thirty-five years of age, and have been fourteen years resident in the U.S.A. He is commander-in-chief of the army, navy, and air force, and of the militia in the Union service. Thirty-two men have held the office.

Article III. provides for the judicial power, and gives the courts power to adjudicate on all matters touching the constitution. Article IV. provides for the admission to the Union of new States, and guarantees to every such state a republican form of gov. Article V. provides the mode of amending the constitution as follows: whenever two-thirds of both Houses deem it necessary Congress must propose amendments, or, on the application of the legislatures of two-thirds of the sev. States, call a convention for proposing amendments; and such amendments are effectual as part of the constitution if ratified by the legislatures of three-fourths of the sev. States, or by conventions in three-fourths of the States, according as one or other mode of ratification be proposed by Congress. Article VI. makes the constitution the supreme law of the land, while Article VII. provides for the ratification of the constitution. The amendments to the federal constitution comprise twenty-one additional articles. The prin. of these amendments guarantee religious freedom and freedom of speech; prohibit slavery, excessive bail, excessive fines, and the infliction of cruel punishments; maintain

the popular right to bear arms ; prohibit quartering of soldiers in private houses in time of peace ; give a person accused of crime the right to a speedy trial ; preserve the right of trial by jury in all cases where the value in controversy exceeds \$20 ; regulate the mode of balloting for the presidential elections ; and guarantee the privileges and immunities and prescribe the status of citizens of the U.S.A. The eighteenth amendment (1919) made prohibition (*q.v.*) of liquor a federal concern, and was repealed by the twenty-first Amendment (1933). The nineteenth Amendment (1920) admitted women to the franchise and gov., and the twentieth (1933) fixed *inter alia* the day and time on which the terms of president and vice-president and also senators and representatives shall end. (On the constitution see further Lord Bryce (*q.v.*) *American Commonwealth*, 1911.) It is to be noted that the constitution does not purport to be a complete scheme of gov., but presupposes the existence of States' govts., whose powers comprise the residuum of legislative functions over and above the common or national matters vested expressly in Congress. Yet, as Lord Bryce points out, there are strange omissions to be found among the restrictions on State powers. The significance of these omissions is that the authors of the constitution evidently had no desire for general uniformity of States' govts. or institutions, their main object being 'to secure the national Gov. against encroachments on the part of the States, and to prevent causes of quarrel both between the Federal or State authorities and between the several States.' Nevertheless, the different States have tended almost to an excess of uniformity, and their legislatures have evinced little desire for experimental changes in their institutions. Each of the forty-eight States has its own constitution, deriving its authority solely from the people of each State. Admission into the union is granted by special Act of Congress. Each State has an elected governor and other executive officers, a legislature of two houses, and a judiciary. The powers of both Houses are co-ordinate, though in some States money bills must originate in the House of Representatives. The States' senates have powers similar to those of the Federal Senate. Sessions are generally biennial ; the governor has the right to summon an extraordinary session, but not to adjourn or dissolve. The governor is elected by the direct vote of the people for a term varying from one to four years. In all but two States he has a veto on legislation, which may, however, be rendered nugatory by an adverse vote of the two Houses. In some three or four States, the Federal Gov. prescribes the form of the local legislature and the president himself appoints the territorial governor and other important officials. The Dist. of Columbia (*q.v.*) is the seat of the Federal Gov.

DEFENCE.—In accordance with the National Security Act of 1947 the armed forces were unified under a secretary of national defence with cabinet rank, under

whom the Army, Navy, and Air Force are organised in three separate Depts., each having a secretary at the head, a civilian but not holding cabinet rank, with two assistant secretaries. Defence is co-ordinated by the National Security Council, of which the members are the president as commander-in-chief, the secretary of state, the secretary of defence, the secretaries of the three service depts., and the chairman of the National Security Resources Board. The secretary of defence, the three departmental secretaries, and the chiefs of staff also form a War Council. Subject to the authority of the president and the secretary of defence, the armed forces are directed by the Joint Board of the Chiefs of Staff.

In Nov. 1948 the direction of the Army was reorganised to provide adequate means of control in the event of an emergency. The office of vice chief-of-staff was created to assist the chief-of-staff, together with two deputy chiefs-of-staff, one concerned with administration, the other with operations. The four administrative services, *i.e.* the adjutant-generals, the provost-marshal generals, the chief chaplains, and the chief of special services (legal, educational, and historical), were grouped under a director of personnel and administration, and the seven technical services, *i.e.* chemical, signal, medical, engineering, ordnance, transportation, and quartermaster's, under a director of logistics. The strength of the Regular Army (Sept. 1949) was 655,600, of which 256,500 were serving overseas. The Regular Army is supplemented by the National Guard, a civilian army, which has risen (1949) to over 300,000 officers and men. In addition, opportunities are offered to men for military training through the Organised Reserve Corps, which includes over 1000 affiliated units belonging to various industrial concerns and their associations and institutions. The Selective Service Act of 1948 was passed with the intention of recruiting men between the ages of nineteen and twenty-five for twenty-one months' service with the Regular Army followed by five years on the Reserve. Women volunteers formerly served with the Women's Army Auxiliary Corps, formed in Sept. 1943. In June 1948 the title of the Corps was changed to Women's Army Corps, which became a permanent part of the Regular Army with an estab. of 500 officers, 75 warrant officers, and 7,500 enlisted women. There are six army areas in the continental U.S., in addition to the military dist. of Washington.

The Naval Establishment is divided into the Navy Dept., in Washington, The Shore Estab. covering most shore activities, supporting and supply services, and the Operating Forces under the command of the chief of naval operations. There are seven bureaux : (1) yards and docks, (2) naval personnel, (3) ordnance, (4) ships, (5) supplies and accounts, (6) medicine, (7) aeronautics. The total strength of the Navy on full-time active service in Feb. 1950 was 471,500 officers and men, including air personnel. Of this

number about 6000 officers and 71,000 men were serving with the Marine Corps. There is a Naval Reserve of about 305,000 officers and 670,000 men. In June 1948 a law was passed allowing the Navy to recruit women volunteers up to an establishment of 500 officers, 20 warrant officers, and 6000 enlisted women for service with the Navy, and 100 officers, 10 warrant officers, and 1000 enlisted women for service with the Marines. The Coast-guard, which becomes a part of the Navy in time of war, consists of 20,000 officers and men. The fleet comprises (1949) over 900 vessels of all categories. Naval shipyards are at Portsmouth, New Hampshire; Boston, Massachusetts; Brooklyn, New York; Philadelphia, Pennsylvania; Portsmouth, Virginia; Charleston, S. Carolina; Puget Sound, Washington; San Francisco, Mare Is., Vallejo, California; and Long Beach, California.

The Air Force was formerly an integral part of the Army. Under the National Security Act of 1947 it formed a separate Dept., but both the Army and the Navy continue to control aircraft allotted to them as an organic part of their equipment. The strength of the Air Force in Aug. 1949 was 57,000 officers, 2000 warrant officers, and 363,300 men. In addition the civilian reserve forces include the Air Reserve (70,000 officers and men), the Air National Guard (41,000), and the Air Reserve Officers' Training Corps (40,000). Aircraft strength is over 19,000 in commission, including 2500 first-line aircraft, and a large number in store.

**LAW.**—Strictly there is no Amer. law in the sense of a common law of indigenous origin, and the laws of the constituent States rest at bottom on the Eng. common law as it existed in the early seventeenth century. The only notable exceptions are to be found in Louisiana and New Mexico, i.e. in ter. formerly subject to France or Spain. These latter States derive much of their civil law from France and Spain and thus, remotely, from the principles of Rom. law. Nor, except within a sphere constitutionally defined, is there a national supreme tribunal to unify legal doctrine. On the other hand, while there is no common law of the U.S. as a sovereign State, each State has its own common law unfettered except by the provisions of certain articles of the federal constitution; and even these provisions do not necessarily conduce to unity of law except the clause requiring that full credit shall be given in each State to the public Acts and judicial proceedings of every other State, which to some extent operates to unify doctrines respecting the conflict of laws. Penalties vary from State to State: e.g. not all States award capital punishment. It is also conceivable that the decisions of the lower federal courts that exist in every State and those of the Supreme Court tend to regularise judicial doctrine, especially in the field of federal commercial law which the States generally follow voluntarily (see **LAW MERCHANT**). In the early decades of this century, however, the unification of law in America was assisted by the

Amer. Bar Association in editing uniform Acts for adoption by all the States, and these Acts, together with a great body of judicial tradition, and much legislation governing the standards to which the Amer. people, irrespective of State, commonly conform, tend to modify the general assumption that, technically, there is no *corpus juris* or body of unified Amer. law. The ultimate safeguard of private rights is to be found in the guarantees in the fourteenth amendment of the federal constitution (1868) which resulted from the Civil War. One of the provisions of this Amendment is that no State shall deny to any person within its jurisdiction the equal protection of the laws; another, equally fundamental, is that no State may deprive a person of life, liberty, or property otherwise than by due process of law. These guarantees, together with that safeguarding the sanctity of contracts, decisively altered the relation between the State and federal tribunals and inaugurated a new era in the legal development of the nation: for issues depending on those guarantees have made the federal courts the agents of the social legislation of the last sixty years arising out of the economic and industrial conditions developed since the Civil War (see **SHERMAN ANTI-TRUST ACT**). Regarding public law, the Supreme Court is absolutely supreme in its power to decide in cases of conflict between the federal authority and the State authorities. The constitution establishes the federal courts, whose jurisdiction extends to all cases arising out of the constitution, including those of an international character, whether between the States or between the U.S. and any other state in the world; and it also establishes a Supreme Court, which is a final court of appeal in these cases. This makes that court the ultimate interpreter of the constitution and places the judicial dept. above any legislation (within the limits of the constitution) whether federal or State.

The Federal Gov. maintains courts to try crimes against the U.S. and civil actions brought by the gov., or which arise out of the constitution, treaties, or laws of the U.S. relating to such subjects as admiralty, banking, patents, and taxation. The federal courts also have jurisdiction in cases between citizens of different States and between those of a State and a foreign State. The judges of all Amer. courts hold office during good behaviour, and may retire at 70 with full pay after 10 years' service. The Supreme Court at Washington consists of a chief justice and 8 associate justices, with original jurisdiction in cases affecting ambassadors or where a State is a party to the suit, and with appellate jurisdiction from inferior federal courts of the States. The U.S. courts of appeal deal with appeals from district courts, and consist of the justice of the Supreme Court for the circuit and all the circuit and district judges within the circuit. There are 93 dist. courts, served by 200 dist. court judges. These are the lowest of the federal courts, and, besides civil cases

they may try all criminal cases arising under the federal laws, including capital crimes. The whole country is divided into ten circuits, each with a circuit court of appeal under the chief justice or an associate justice. Cases from inferior courts are usually heard in these appeal courts and then in the supreme court on a writ of *certiorari* (q.v.), but in certain cases, as when a decision is adverse to the constitutionality of an Act of Congress (see under ACT), the appeal may go to the supreme court direct. There are also various special courts with jurisdiction in customs, patents, and taxation cases. These are the court of claims, the U.S. customs court, the tax court, and the court of customs and patents appeals. The State courts try all civil and criminal cases arising under State laws, but decisions of the courts of last resort as to the validity of treaties or on constitutional issues are subject to review by the Supreme Court. The lowest courts are those of justices of the peace; there are also municipal and police courts in many towns and cities with power to commit for trial on criminal charges or to try civil cases involving small amounts of money. See also APPEALS in U.S.A.; BAR ASSOCIATION, AMERICAN; COMMERCE COURT (U.S.A.); CRIMINAL LAW—United States; JUDGE—Judges in the U.S.A.; LEGAL EDUCATION; POLICE—Police Courts, STATE OR DISTRICT ATTORNEY (also ATTORNEY-GENERAL).

**FINANCE.** *Federal.*—There has been a National Ann. Budget System and an independent Audit of Gov. Accounts since 1921. (For U.S. revenue 1947-49 see under PUBLIC REVENUE. See also under PUBLIC DEBT.) In 1919 over thirty per cent of the budget was assigned to national defence; over twenty per cent to interest on the national debt and refunds owing under the tax laws; over seventeen per cent to war veterans' benefits; over ten per cent to international finance, etc., thus leaving slightly over twenty per cent for all remaining expenditure.

*State and Local Finance.*—In the financial year 1947 the revenue of the 48 States and over 150,000 local authorities was \$15,320,000,000. Of this total, over seven per cent was accounted for by fiscal aid from the federal gov., nearly eight-two per cent came from tax revenue, and the balance from miscellaneous charges, etc. Of the revenue resulting from taxes in this period property taxes (almost entirely imposed by local govts.) brought in nearly forty-four per cent, and sales taxes (general sales taxes were imposed by 27 States in 1948) nearly thirty per cent. The financial powers of the States are very great.

**SOCIAL SECURITY.** The Social Security Act of Aug. 1935, since amended, makes provision for a system of old age, survivors', and unemployment insurances, organised by the Federal Gov. Federal grants are made to the States for welfare services and public assistance. In 1946 the Social Security Administration replaced the Social Security Board: in this

body is vested the Federal responsibility for these programmes. In addition, there are State insurance schemes which differ in their scope and operation from State to State. See also NEW DEAL.

**HISTORY.** *Colonial America.*—It is fairly well estab. that the E. coast of N. America was discovered in A.D. 1000 by Leif Ericsson and his band of Norsemen. They planted a colony in Greenland and in 'Vinland,' probably some place on the coast of what is now New England. But they left no traces, for the colonies perished and the memory of them died out. It was left to Christopher Columbus on Oct. 12, 1492, to make the first historic landing on Amer. soil. Columbus's first landing was in the Bahama Is. He believed he had landed in the Indies and hence called the natives Indians. His return to Spain fired the imagination of the people. The greed for land at once arose. The Portuguese had already sailed along the shores of Africa. So there arose a dispute between Spain and Portugal over the ownership of this new world. They appealed to Pope Alexander VI., who, in his bull of May 2, 1493, drew an imaginary line of demarcation. Under this all the New World, except a part of Brazil, was given to Spain.

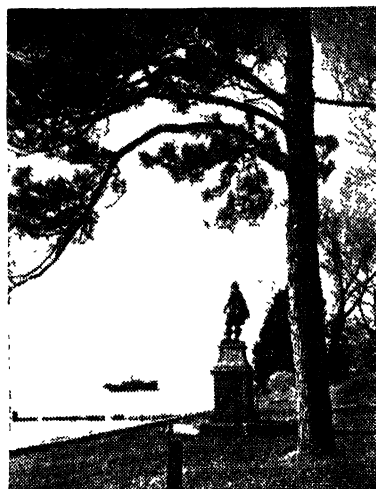
Soon the King took part in the exploration of the new lands. Henry VII. granted a permit to John Cabot, to go on a voyage of discovery. To Cabot, who, like Columbus, was an It., belongs the honour of having first discovered N. America (apart from Ericsson). Cabot landed in 1497, either on Cape Breton Is., Newfoundland, or Labrador. In 1498 he made a second voyage, following the coast from Long Is. right down to Cape Hatteras. Amerigo Vesputci (see Vesputci), made three voyages of discovery, landing on the coast of Brazil in 1499.

Now began an era of adventure and exploration. Some were attracted by adventure, others by the lure of the gold and jewels they expected to find. The great maritime nations of that time (Spain, England, France, and Portugal) led in this, followed by Holland and Sweden. The Spaniards discovered and explored all Central and S. America and then turned their attention to N. America. Ponce de León landed in Florida. Hernando de Soto discovered Cuba, landed in Florida and wandered all over the S. States discovering the Mississippi R., which he crossed into what is now Arkansas and Missouri. From France came Jacques Cartier in 1534, discovering the gulf of St. Lawrence. On a second expedition he sailed up the St. Lawrence as far as the present site of Montreal.

Sir Walter Raleigh founded a first colony in 1585, in the ter. he named Virginia, after the 'virgin queen.' This first colony failed, and the colonists were brought back to England by Sir Francis Drake. They took back with them two indigenous plants, the potato and tobacco. In 1607 a second Virginian colony was estab. at Jamestown, by John Smith (q.v.). By 1649 Virginia, which had now a royal charter and considerable self-gov., began



to be settled by cavaliers who founded the far-famed 'First Families of Virginia.' The foundation of Maryland marked a new kind of colony, one practically owned and ruled by a lord-proprietor holding a royal charter. Religious persecution in England led to the foundation of the New England colonies. The first of these occurred in 1620 when the Puritans known as the Pilgrim Fathers, landed at Plymouth Rock, in what is now Massachusetts, having sailed on the *Mayflower*. Georgia was founded by James Oglethorpe and was the last of the thirteen original colonies which afterwards became the first



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#### THE STATE OF CAPTAIN JOHN SMITH ON JAMESTOWN ISLAND, VIRGINIA

The Jamestown colony, the first permanent English settlement in America, was established by John Smith on May 13, 1607, on a marshy peninsula, now an island, in the James River

thirteen States of the U.S.A. Pennsylvania was founded by the Quakers, led by Wm. Penn. Ten of these colonies were Eng. New York had been founded by the Dutch as New Amsterdam and was afterwards to be taken by the Eng. New Jersey was started as a Dutch colony, but soon became Eng. Delaware was claimed by the Dutch, but was first settled by the Swedes, and finally came into possession of the Eng.

The wars of Europe had their repercussions in America. France and England engaged in the War of the Sp. Succession. (1702-14). The Indians and the Fr. massacred Eng. colonists. In 1710, the colonists, aided by a small force of Eng. captured Port Royal and took the ter. of Acadia, which was henceforth called

Nova Scotia (*q.v.*). By the Peace of Utrecht, Acadia, Newfoundland, and the Hudson Bay ter. were ceded to England. The boundary, however, between the Eng. colonies and Canada was not settled, and there was the question of control of the Mississippi valley. The Fr. claimed all N. America, except the Hudson Bay region and the strip of Eng. colonies on the Atlantic coast. In Europe, from 1744 to 1718 England and France were on opposite sides in the War of the Austrian Succession. The Amer. colonies were soon involved. Organised by Governor Shirley of Massachusetts, an expedition under Wm. Pepperell of Maine laid siege to and captured the seemingly impregnable Louisburg, but the peace of Aix-la-Chapelle gave this back to France. There was a fresh dispute between France and England about the boundaries of Acadia. They were rival claimants for the Ohio valley.

*The Conquest of Canada.*—In 1754 the war began which was to decide the language and civilisation of N. America. In command of a small body of Virginia militiamen, George Washington (*q.v.*), came into conflict with the Fr. at Great Meadows and the Fr. commander and nine of his men were killed. The war thus started in America two years before it broke out in Europe. The odds seemed to favour the Fr. They were a united, cohesive body. They had many forts. They had the friendship of many of the Indians. The Eng. colonists were not united. They were jealous of each other, and the colonial soldiers were jealous of the Brit. regulars. After initial setbacks, James Wolfe (*q.v.*), captured Louisburg (1758); at about this time the Fr. had to evacuate Fort Frontenac and in Sept. 1759 was fought the decisive battle for the capture of Quebec, which fell into the hands of the Eng. and the sovereignty of France in N. America was practically ended. By the Peace of Paris, signed 1763, England gave back Cuba and the Philippines to Spain and received Florida instead. France ceded to Spain New Orleans and the vast ter. known as Louisiana (*q.v.*) (which she regained in 1800). To England France surrendered the Ohio Valley, Canada, everything except two is. in the Gulf of St. Lawrence.

*The American War of Independence.*—The war helped to unite the colonists in the thirteen settlements, and gave them a new conception of their strength and importance. They began to reconsider their position with regard to England. The Eng. Navigation Acts (*q.v.*) provided a closed market in England to certain colonial goods, but they hampered colonial trade, as all trade went via England, and the prices of goods were raised by duties in transit. Smuggling became universal. The colonies also began manufacturing for their own needs, and England forbade this, the general aim being to export manufs. to the colonies and import raw materials and food. The situation came to a head when George Grenville as Prime Minister decided that the Navigation Acts should

be strictly enforced; that a standing army should be garrisoned in the colonies; and that the colonies should be taxed. James Otis, an eloquent Boston lawyer called upon the colonials to resist. In Virginia, Patrick Henry voiced similar sentiments. England proposed to send the standing army to the colonies to protect them from the dangers of Indian outbreaks, but the colonists believed the army was to be sent to overawe them. Grenville proposed to raise the money for part of the support of this army by a stamp-tax.

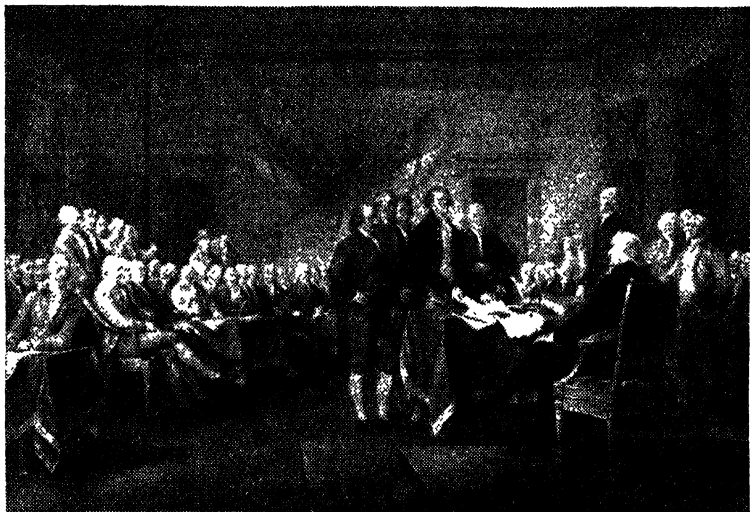
Under the leadership of Massachusetts the colonies held a Stamp Act Congress in New York to petition the king and Parliament. Riots occurred and stamps were destroyed. The cry was taken up—'No taxation without representation.' The Eng. gov. failed to appreciate this fundamental cause of discontent, and its gestures of conciliation were therefore of no avail. The Amer. objection to 'internal' taxes imposed from outside was recognised, and the stamp tax was abolished. But the right to tax remained, and as the Amers. appeared to be willing to accept 'external' taxation, i.e. customs duties, Townshend as chancellor of the exchequer, secured in 1767 an import duty on tea, glass, and other articles. The revenue so obtained was used to pay the officials of the Crown appointed to the colonies. To the Eng. gov. this seemed reasonable, but to their surprise Amer. protests continued. Mob opposition which had been silenced by the repeal of the Stamp Act was again roused, and the import duties were repealed except that on tea, which was retained simply as a token tax. The colonials refused to buy supplies of Eng. tea, and smuggled it from Holland. In 1773 tea-laden vessels reached Amer. ports. In Charleston the cargo rotted in storage. In Boston a band of men disguised as Indians, boarded the tea ships and tossed tea chests into the sea, an episode known as 'the Boston tea-party.' King George III. called upon Parliament to pass drastic Acts, including the removal of the cap. of Massachusetts from Boston to Salem, and the annulment of the colony's charter. All the colonies prepared to stand by Massachusetts, and the famous Continental Congress was held at Philadelphia, Sept. 5, 1774. It was resolved to draft an appeal to the king, to the people of England, and the people of Canada. The idea of independence was disavowed and in fact it was not until later that the elements which did press for independence gained control. Events moved rapidly. Gen. Gage was sent to Massachusetts with a military force and became both military and civil governor. Whilst attempting to arrest two of the popular leaders his troops opened fire on a small body of Amers. at Lexington, but in the fight which followed at Concord they lost 273 men and the Amers. 93. The War of Independence had started, the product of complex factors, but basically due to Britain's refusal to recognise that, economically and psychologically the

Amer. colonies had attained a status which demanded an alteration in the theory and practice of their relations with England.

The second Continental Congress met in Philadelphia and appointed George Washington commander-in-chief of the Amer. forces. It disclaimed any intention of throwing off allegiance to the crown. At Boston the Brit. were reinforced by the arrival of Howe, Clinton, and Burgoyne with additional troops which raised the total forces to 10,000. The Amer. army occupied the mainland and a force was sent to fortify Bunker Hill. Here on June 17, 1775, was fought a battle won by the Brit. only with great loss. On July 4, 1776, the Continental Congress passed its Declaration of Independence, largely written by Thomas Jefferson. Prior to that, in March, Gen. Howe evacuated Boston, as Washington had fortified Dorchester Heights and by heavy bombardment obtained the mastery of the city. Despite Brit. successes at Long Is., White Plains, and Fort Mifflin, and the fall of Newark, New Brunswick, and Trenton, Washington defeated Lord Cornwallis at Princeton (1776). Sir Leger was defeated by Herkimer, and Gen. Burgoyne surrendered to Gates after the battle of Saratoga.

In Feb. 1778 the Amer. emissaries concluded a treaty with France whereby that country was to come to the aid of the Amers. and thus strike a blow at their old enemy, England. Also that spring, Lord North reversed his policy and induced Parliament to pass laws enabling him to send peace commissioners to America. All the Amers. had asked for and more was promised, but the terms were refused. Spain also intervened in the war in 1779 by using New Orleans as a base for privateers against Brit. shipping. In 1780 the Netherlands also joined in the war against England, while Catherine II. of Russia formed a league of armed neutrality, which assisted the Amer. colonies by obstructing the use of England's sea power. Thus the Amer. War of Independence was part of a general war in which most of the great powers participated. Late in 1777, prior to these events, the Amers. had been defeated at the Brandywine and at Germantown, and Howe had occupied Philadelphia, the cap. Clinton succeeded Howe as commander of the Brit. forces and was ordered to evacuate Philadelphia and return to New York. Washington hung on his flanks and the drawn battle of Monmouth was fought June 28, 1778. It was the last general engagement fought on N. soil. Clinton occupied New York, Washington took up his position at White Plains nearby, and here the enemies remained watching each other for three years, while the real fighting took place in the S. At first everything went well with the Eng., but in the late summer of 1781, Cornwallis found himself besieged in Yorktown by Washington and Lafayette, the Fr. commander. On Oct. 19 he surrendered.

For sea fighting, the Amers. had built men-of-war and at one time 70,000



*U S Information Service , American Embassy*

**THE DECLARATION OF INDEPENDENCE : THE PAINTING BY JOHN TRUMBULL**

Here before the Congress which adopted the Declaration, Thomas Jefferson offers the document to John Hancock for his signature. On Jefferson's left stands Benjamin Franklin, and on his right John Adams, Roger Sherman, and Robert Livingston.

men were engaged in naval warfare. The outstanding hero was John Paul Jones (*q.v.*). Many of the battles he and his fellow commanders fought were in Brit. waters.

The peace treaty was signed at Paris, Sept. 3, 1783, the Amer. commissioners being Benjamin Franklin, John Jay, and John Adams. The peace of Paris with the Amers. and the other treaties which Great Britain signed on the same day with France and Spain, divided N. America among Spain, the Brit. Empire, and the U.S. Spain received the land W. of the Mississippi and S. of a line which gave her Florida. England kept what is now Canada, though the boundary was not clearly settled at the time. France took a few W. Indian colonies. The Amers. now had their independence, but their country was in a state of anarchy. Finally Alexander Hamilton summoned a convention at Philadelphia (1787) to draft a constitution and form the permanent gov. for the new country. The constitution was the result of a series of compromises, and there were vigorous contests before the States ratified it, the last being Rhode Island in 1790. The actual voting for the first president and vice-president took place in Jan. 1789. By common consent Washington was chosen as head of the State. John Adams was chosen vice-president. New York City became the first temporary cap., and Congress settled down to the work of gov. It passed a Tariff Act to

raise revenue, it enacted a law forming the president's cabinet, and it created the Supreme Court of the country. It was decided that the cap. should be the present city of Washington. The national debt was founded and paid in interest-bearing bonds. In 1794 came the first real test of the new gov.'s power. Farmers in Pennsylvania resisted the excise tax on whisky. Washington sent to the governors of Pennsylvania, Maryland, New Jersey, and Virginia for troops, and the rebellion collapsed. Two terms of Washington's presidency saw the rise of political parties. Alexander Hamilton founded the Federalist party, Thomas Jefferson, the Republicans.

The young republic soon became involved in the troubles of Europe. England, engaged in a war with France, claimed the right to search Amer. neutral vessels, and impressed seamen of Amer. ships. Washington had determined to retire to private life at the end of his second term. The first real campaign for the presidency now began. John Adams, who was the Federalist candidate, was chosen by the electoral college in 1797 by seventy-one to sixty-eight votes, and Jefferson became vice-president. Trouble now broke out with France, whose gov. refuse to receive the Amer. minister, and war was only narrowly averted. Adams's administration became odious on account of the Alien and Sedition Laws. The former gave the president power to banish from the country, without giving

any reason and without a trial, any alien he considered dangerous. Adams also sought to silence the Press. By the election of 1800, Jefferson became president.

Jefferson's assumption of office marked the beginning of real democratic rule in America. It was a rapidly growing country over which he presided. The 1800 census showed a pop. of over 5,200,000, though one-fifth were slaves. Virginia was still the most populous State, Pennsylvania second, New York third, Massachusetts fourth. Already the people had begun to look westward, and more than half a million had settled in the Mississippi valley. The greatest of Jefferson's achievements was the famous Louisiana Purchase, by which an empire was added to the U.S.A. for \$15,000,000. The treaty, which was signed with France, April 30, 1803, added 1,171,931 sq. m. of ter. to the U.S.A., a greater domain than the thirteen original States combined. With the carving up of the Louisiana Purchase into States, the Federalists saw the W. and S. ruling the E., and hence they conspired to shatter the Union and set up a New England confederacy, adding thereto New York State. New York was Democratic, but the Federalists enlisted the support of Vice-President Aaron Burr (*q.v.*) whom they offered to support for the governorship of New York. Alexander Hamilton stood in the way, and helped to defeat Burr's candidature. The conspiracy to break the Union was crushed. Burr challenged Hamilton to a duel. Hamilton fell mortally wounded; Burr's political career was finished.

Jefferson had been triumphantly re-elected president in 1804. France and England were once more at war. Napoleon issued his Berlin Decrees; England resorted to this by closing all her ports to neutrals. Between them England and France were paralysing Amer. sea-borne commerce, and Jefferson saw no way to make war upon the two greatest powers in Europe. On Dec. 22, 1807, he got Congress to pass the Embargo Act, by which, for a time, all foreign commerce was forbidden. Jefferson believed the warring powers would abandon their decrees because they needed Amer. commerce. He was mistaken, however, and Amer. farm products accumulated in warehouses, and ships lay rotting in harbours. Six days before Jefferson retired from the presidency he signed an Act repealing the Embargo Act.

In 1808 Jefferson's secretary of state James Madison, one of the chief framers of the constitution, was elected fourth president of the U.S.A. There were skirmishes with the Shawnee Indians under Tecumseh. Then came the culmination of the troubles with England.

*The War of 1812-14.*—It was evident that the Amers. would be adamant unless the orders in council were repealed. Meanwhile, Congress was pressing Madison to declare war. The Brit. ministry was slowly yielding on all the points pressed by the Amers., and the orders in council were repealed on June 23. But before the news of this repeal came to

America Madison had signed a declaration of war. In the autumn he was re-elected president after a severe contest, the Federalists being opposed to the war.

The war opened badly for the Amers. The Brit. general Isaac Brock invaded the U.S.A. from Canada. On Aug. 16, 1812, Governor Hull surrendered Detroit and with it Michigan ter. without striking a blow. On the same day Fort Dearborn, on the site of the future city of Chicago, was taken by Indians. The Amers. were more successful at sea, but though the superior might of the Brit. navy soon became evident, Amer. privateers did considerable damage to vessels of the Brit. merchant marine. In the meantime, on land the Amer. troops met with disaster in a fight at the R. Raisin. This rallied the men from Kentucky and the neighbouring regions, and under Gen. W. H. Harrison they invaded Canada and a battle was fought on the R. Thames, Oct. 5, 1813, which the Amers. won. Tecumseh, the Indian chief, being slain. As a result of this victory, Michigan was once more held by the Amers., and the war in that quarter was ended. Prevost abandoned the campaign to invade New York State. But by now the Brit. Gov. was able to display its true military power. A flotilla of ships reached Chesapeake Bay in Aug. 1814 and an army was landed which met the Amers. at Bladensburg, defeating them. Washington, the cap. of the nation was captured. The Capitol, the White House, residence of the Amer. presidents, and the navy yard were burnt down. It was decided to march northward and take the important city of Baltimore. However, the troops were stopped by Amer. resistance and the fleet could not pass Fort Mifflin. The Brit. abandoned the campaign and sailed away with the troops. Meanwhile in Alabama, Andrew Jackson defeated the Indians at Talladega. He was then made commanding general of all the S. ter. In the autumn of 1814 it became known that the Brit. had decided upon an attack on New Orleans with the object of capturing the entire Louisiana ter. Jackson hastened there and put the city into a state of defence. The enemies met in front of New Orleans on Dec. 23 and 24, 1814, and fierce battles were fought without victory for either side. On Christmas Eve representatives of England and the U.S.A. signed a treaty of peace. Jan. 8, 1815. It was the last time Amer. and Brit. soldiers met as enemies. The treaty merely ended hostilities; there was no cession of ter. by either side; there was no written agreement about impressment of seamen, and all the old disputes about boundaries, fishery rights, and navigation of the Mississippi were left open for settlement at a later time.

*The U.S.A. before the Civil War.*—In 1816 James Monroe (1758-1831) was elected president, and again in 1820. Early in his first administration trouble broke out with the Seminole Indians, but was speedily ended by Amer. troops under Andrew Jackson. This brought the

country into conflict with Spain, which still owned Florida (Britain having returned it in 1783). In 1822, however, Spain ceded that country to the U.S.A. for \$5,000,000, and by the same treaty the U.S.A. gave up its claim to Texas, which thus became Sp. ter. The U.S.A. was rapidly growing in pop. and the W. was being settled. A number of new States had been admitted to the Union, including Louisiana and Indiana. Now came the question of admitting Missouri, and it was then that the slavery question became acute. The N. wanted to stop the admission of States in which slavery was

measure of any importance was passed. In 1828 he ran for re-election, but was heavily defeated by Andrew Jackson (1767-1845).

In the presidential election of 1833 Henry Clay unsuccessfully opposed Jackson. The issue between them was the United States Bank under whose charter and powers the financial control of the nation rested. Jackson was its opponent, believing it was corrupting the politics of the nation. On his own authority he removed from the bank the U.S. deposits and thus ruined it. He practically dictated the presidential nomination of Martin van



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#### THE COVERED WAGON : EMIGRANTS CROSSING THE PLAINS

allowed ; the S. wanted exactly the opposite. Missouri was finally admitted in 1820 by the Missouri compromise (*q.v.*), which in addition decreed that slavery should be prohibited in all the remainder of the Louisiana ter. N. of 36° 30' N. lat. In Dec. 1823 Monroe signed the document which had made his name famous, the message embodying the Monroe Doctrine (*q.v.*).

The election of 1824 gave Andrew Jackson the most votes in the electoral college, but not a majority over all the other candidates. His nearest opponent was John Quincy Adams (1767-1848), who was the son of the second president. The election of a president was therefore thrown into the House of Representatives and Adams was chosen. He was never popular, both Houses of Congress were against him and no administrative

Buren (1782-1862) by the Democratic party in 1836. Van Buren had been his secretary of state and later vice-president. Shortly after van Buren's induction came the great panic of 1837, for which his political opponents blamed the Democratic party. In 1837 van Buren urged the creation of an independent treasury of the gov. itself, to take the place of the U.S. Bank, and this finally became law in 1840. In the same year van Buren was re-nominated for the presidency by the Democrats. The Whigs nominated Wm. Henry Harrison (1773-1841), and John Tyler was nominated for vice-president. Harrison was easily elected, but he *d.* exactly one month after taking office and Tyler (1790-1862) succeeded him. A feature of his administration was the Webster-Ashburton Treaty between the U.S.A. and England whereby the

boundaries between Maine and New Brunswick, Canada, were settled. The Texas question soon came to the fore. In 1827 Mexico had freed her slaves, but her N. prov. of Texas refused to do so, and in 1836 declared her independence. This was recognised by the U.S.A. and by some of the European powers; and having defeated the Mexicans in the battle of San Jacinto, Texas applied for admission as a State of the U.S.A. In 1844 Tyler sent in a treaty annexing Texas, but the Senate rejected it. The question thus became a main issue in the 1844 presidential campaign. The Democrats pronounced for the annexation of Texas and finally the Democrat James K. Polk (1795-1849) was chosen. The Texas matter had been settled before Polk took office, Congress passing a joint resolution to annex that vast ter. and admit it to the Union. Polk announced an ambitious programme and carried it out. A Bill recreating an independent national treasury became law in 1846 and in the same year he signed a Tariff Bill which lowered many of the duties in the old Whig Tariff Bill. He now turned his attention to the Oregon problem involving the great ter. in the N.W. from the Rocky Mts. to the Pacific, lying between 42° and 54° 40' N. lat., which had been occupied jointly by England and the U.S.A. In 1846 a compromise was arranged; instead of 54° 40', the boundary line was fixed at 49° N. lat., the U.S.A. thus securing 300,000 sq. m. of ter. and England securing for the future Canada a sea coast on the Pacific and the whole of Vancouver Island. The last item in Polk's programme was the acquisition of California. California belonged to Mexico and that country refused to sell it. Occasion for war and conquest was found in the dispute between the U.S.A. and Mexico over their boundaries. Polk had sent General Zachary Taylor with an army of occupation into the disputed Texas ter. On May 8 and 9, 1846, a Mexican army was defeated at Palao Alto and Resaca de la Palma. Polk made a declaration of war on Mexico and a series of battles resulted in a total Mexican defeat. The treaty of peace, signed Feb. 2, 1848, ceded to the U.S.A. the ter. which is now the States of California, Nevada, and Utah and parts of New Mexico, Arizona, and Colorado.

Only nine days before the treaty was signed gold was discovered in California, and the famous gold rush began which in two years increased the pop. of that State to 100,000. Zachary Taylor (1784-1850), nominated by the Whigs, was elected president in 1848. The slavery question at once became prominent. California was claiming entrance into the Union and in 1849 adopted a State constitution excluding slavery. Taylor was a southerner and slave-owner, but he recommended that California be admitted as a free State. Enraged southern statesmen freely spoke of dissolution of the Union. The year 1850 was a fateful one. Clay brought into the Senate his compromise measures which provided, among other things, for

the admission of California as a free State, prohibition of slavery in the Dist. of Columbia, where the cap. was situated, and a new fugitive slave law. While the debate was still pending, President Taylor *d.* He was succeeded by the vice-president Millard Fillmore (1800-1874). California was admitted as a free State, but the fugitive slave law was also adopted. In many N. States there was covert rebellion against the law.

In the presidential election of 1852 the main issue was the fugitive slave law, and the Democrats nominated Franklin Pierce (1804-69). He carried all the States except four, thus obtaining a sweeping victory. It was the death-blow to the Whig party. Pierce began well, but he soon lost popularity, being an opponent of the abolitionists. At this moment Stephen A. Douglas attacked the Missouri Compromise, whereby ter. N. of 36° 30' was to be free soil. He brought in a Bill which maintained that it was the purpose of Congress that all future ters. and States be admitted on the same principle, viz. that the people themselves should decide for or against slavery. Secondly, he maintained that the Missouri Compromise Bill was unconstitutional. Douglas then introduced another Bill, known as the Nebraska Bill, virtually repealing the Missouri Compromise which had stood as a treaty between N. and S. for over thirty years. It passed both houses. Throughout the N. mass-meetings and legislatures denounced the Bill, and condemned Douglas. His action alienated N. States, which had hitherto been Democratic, and it paved the way for the formation of the new Republican party, which had its inception in Ripon, Wisconsin, on March 30, 1854, where the citizens called for the formation of a free soil party to be known as Republican.

In the presidential campaign of 1856 the Democratic convention nominated James Buchanan (1791-1868), and the platform endorsed the Nebraska Law. The Republicans nominated John C. Fremont. Buchanan was elected, carrying ten S. and five N. States, while Fremont carried all the rest of the N. After the Nebraska Bill was passed, people from Missouri had poured into Kansas for the purpose of making it a slave State; and the N. sent bodies of immigrants into the ter., determined to make it free soil. The free-soilers framed a constitution making Kansas a free State and it was ratified by the people, the pro-slavery party ignoring the election of a territorial legislature. Buchanan appointed R. J. Walker governor of Kansas. Walker was a Democrat and a slave-owner, but he would have no part in the pro-slavery machinations. A pro-slavery convention met at Leecompton and produced a constitution which in effect meant that Kansas would be a slave State. Walker had promised the people a vote on it. Buchanan had supported him, but he now broke his word and prepared to force the admission of Kansas with the Leecompton constitution. He sent the constitution to Congress and urged that Kansas be

made a State under it. It was at this juncture that Douglas, who now saw that the Nebraska Bill had been a mistake, defied the president and his party and opposed the Kansas constitution in a speech which made him once more the favourite of the N. Democrats and defeated the Bill not in the Senate, where he spoke, but in the House. At the opening of the Civil war, Kansas was finally admitted as a free State. (See also DRED SCOTT CASE, THIS.)

On Oct 17, 1859, a crowd of abolitionists and Negroes seized the U.S. arsenal at Harpers Ferry, Virginia. The gov. sent forces under Colonel Robert E. Lee and J. E. B. S. Stuart. The leader of the attack on the arsenal was captured. It was John Brown of Pottawatomie. He was tried for treason and murder and hanged.

Then came the momentous presidential campaign of 1860. The Democrats were divided among themselves; the Republicans nominated Abraham Lincoln on a platform which pronounced slavery an evil and denied the right of Congress to give legality to slavery in any ter. Lincoln obtained 180 votes in the electoral college, 152 being enough to elect. Lincoln had swept the N., but the threats of secession made by S. orators for forty years were about to be realised. Some months before Lincoln was inaugurated as president, the S. Carolinians held a convention arising out of which, on Dec 20, 1860, they formally passed secessionists resolutions. They repealed the Act of 1788 by which their State had adopted the constitution and proclaimed the union between S. Carolina and the U.S.A. at an end. Mississippi, Florida, Alabama, Georgia, Louisiana, and Texas soon followed their example at similar conventions. The seven States held a joint convention at Montgomery, Alabama. February 4, 1861, adopted a temporary constitution and chose as provisional president and vice-pres. J. Jefferson Davis and A. H. Stephens of Georgia respectively. The whole move seemed fantastic to the people of the N., in view of the Republican pledge that they would not interfere with slavery where it already existed, and the further fact that both Houses of Congress were still Democratic. While these events were in progress, President Buchanan vacillated. As State after State seceded, their senators and congressmen withdrew from Congress. In many of the S. States, forts, arsenals, and munition supplies belonging to the national gov. were taken over by the Southerners. Before Buchanan left office this was the case everywhere with a few striking exceptions, the chief of which were the forts guarding the harbour of Charleston, S. Carolina, where secession began. Here Major Robert Anderson left Fort Moultrie and took its guns to the stronger Fort Sumter, where he prepared to hold out with the regular Amer. soldiers. Buchanan sent the *Star of the West* to carry further ammunition supplies, but it was fired upon by the shore batteries in charge of

S. Carolinians and driven away. These constituted the first shots in the war.

*The Civil War.*—In March 1861 Lincoln was inaugurated as president. In his speech he affirmed that he did not propose to interfere with slavery where it already existed. He said he would uphold the fugitive slave law. He said he would support a proposal made in the House of Representatives to add an immutable amendment to the constitution which would make slavery perpetual in the States where it already existed. But he also said that the Union was intact and must remain so. He asserted that no State could withdraw from the Union, and that it would be his duty to preserve, protect, and defend the Union.

A little more than a month later, Lincoln, against the advice of a majority of his cabinet, decided that Fort Sumter must be relieved, and in accordance with a promise made to the governor of S. Carolina, notified him, on April 8, 1861, of this intention. The Confederate cabinet was also divided, but militant counsels finally prevailed and Gen. P. G. T. Beauregard, who had resigned his post in the Amer. army and was now in charge of the Charleston forces, was ordered to take the fort. The bombardment began on April 12, and thirty-four hours later the fort was surrendered. Two days later Lincoln issued a call for 75,000 troops. N. Democratic leaders rallied to the cause. In the S., Virginia, which had at first been against secession, now joined the Confederacy and soon all the eleven S. States were united. There were four border States which were also slave States—Delaware, Maryland, Kentucky, and Missouri. Special efforts were made by the S. to win Missouri and Kentucky. The governors of those commonwealths favoured secession, but their legislatures defeated them.

In the conflict which was now beginning the N. had certain great advantages which were bound ultimately to weigh decisively in the balance. It had four times as many white people as the S. It had greater wealth. It was immeasurably more advanced in manufactures, the S. being mainly agric. and dependent for most other things on purchases from the N. and from Europe. The N. also had better railway lines. It was completely self-contained. It could meet all its own needs and those of its armies. If there was to be a lengthy war, the N. numbers would tell. The N., too, had the stronger navy and soon had command of the sea, enabling the gov. to blockade the ports of the S.

If Lincoln called for 75,000 troops, Davis asked for 100,000 and at the same time moved the cap. to Richmond. The first real clash at arms came on July 21, 1861, between the N. army under Gen. Irving McDowell and the Southerners under Beauregard, at the battle of Bull Run. The Union forces were completely routed, retreating as far as Washington. While the fighting was going on in Virginia and Missouri, relations with England assumed the first importance. There

was dismay in the N. when on May 14, 1861, a proclamation of neutrality was issued by England which accorded to the Confederacy belligerent rights such as are granted to a sovereign nation. Most of the European nations soon followed. Nor was the situation improved when the so-called Trent affair occurred. But the N. was beginning to gather strength. Nearly half a million men had come to the colours when only about half that number had responded so far in the S.

By 1862, Kentucky became the scene of various engagements and the first advance towards the S. was begun. Albert S. Johnston, one of the most brilliant men in the Confederate armies, was in charge. Opposed to him was Ulysses S. Grant. After sev. battles and a brief investment Grant captured Fort Donelson on the Cumberland R.; the Confederate Gen. Buckner was forced to accept Grant's stipulation of unconditional surrender, and gave up an army of 14,000 men. The opposing forces next met in battle at Shiloh on April 6, 1862. The first day's fighting favoured the Confederates, but Johnston was killed. In the second day's fighting the Union forces won and the Confederates retreated to Corinth. One of the results of this battle was that Grant discovered in W. T. Sherman one of his ablest lieutenants, and from that time on assigned to him some of his most difficult tasks. Another great blow was struck at the Confederates when a fleet under David G. Farragut (*q.v.*) ran past the forts protecting New Orleans and captured it.

In March 1862, Gen. McClellan came up with the Confederates at Yorktown. His army had been weakened by the sudden withdrawal of 25,000 men to defend Washington, and he settled down for a siege, only to find that the enemy had retreated. He met them in battle at Williamsburg where once more the enemy retreated towards Richmond. McClellan was again ready to move, when the officials at Washington conceived the idea of crushing Jackson who was in the Shenandoah valley. President Davis sent reinforcements to Jackson. That great soldier defeated Banks at Winchester, evaded the other two Union armies which were seeking him, and triumphantly led his men back to join the forces in line near Richmond. In the meantime, on May 31 and June 1, McClellan's army fought a great battle at Fair Oaks. At first it seemed as if the Union force had lost the day, but the sudden and timely arrival of a new corps changed things and the Confederates were put to flight. McClellan was now only 6 m. from Richmond, but the swamps of the Chickahominy lay between and saved the cap. for the time being. A new Confederate commander came upon the scene, Robert E. Lee. Davis appointed Lee as commander-in-chief of the S. armies. Lee was quick to take advantage of the pause in McClellan's movement. He rushed up reinforcements from all over the S. until he had an effective fighting force of 90,000 men against his enemy's 100,000.

Then ensued the Seven Days' battles. Two severe engagements were fought in the last days of June at Mechanicsville and Gaines Mill, and on July 1 was fought the battle of Malvern Hill. The Union forces settled down at last on the bank of the James R., while Lee withdrew to the defences of Richmond. Once more McClellan was ready to attempt the capture of Richmond. But all his plans were rendered nugatory, because the gov. ordered him to return with his army to cover Washington. There was dissatisfaction in the N., but there was really not much cause for complaint; Kentucky and Missouri had not seceded; Arkansas and Tennessee had been taken by Union forces; New Orleans was in Union hands. The Union leaders were already in process of encircling the Confederacy. The administration made General Halleck commander-in-chief and gave Gen. Pope the best part of McClellan's army. On Aug. 29, 1862, was fought the second battle of Bull Run and the Union armies were beaten. Another defeat at Chantilly completely destroyed Pope's reputation as a general. Lincoln called on McClellan to resume command of the army at the Potomac once more. Lee had moved into Maryland, thinking to win that State to the Confederacy, to capture Baltimore, and then advance into Pennsylvania thus carrying the war into Union ter. The stage was now set for the great struggle at Antietam, Sept. 17, 1862. The battle was drawn, 23,000 dead being left on the field. Lee retreated across the Potomac and McClellan delayed in following his enemy. He was now relieved for good. Lincoln then took one of his most important steps. Hitherto he had merely struggled to preserve the Union intact. The slavery question had been held in abeyance for fear of alienating the Democrats in the N. and the people in the border States. But now, on Sept. 22, 1862, he issued his famous proclamation of emancipation, declaring that the slaves in all States in rebellion against the gov. should be free on and after Jan. 1, 1863. The reaction in Europe was immediate, most nations being in sympathy with the abolition of slavery. But there was a reaction in the N. itself. The Democrats made big gains in the Nov. elections and it was only New England and the border States which kept the House of Representatives Republican.

In the autumn of 1862 Rosecrans won victories at Corinth and Murfreesboro, and most of Tennessee was in his possession. In the E. on Dec. 13, 1862, Lee severely defeated Burnside in the battle of Fredericksburg. In the first days of May the Confederates won a great battle at Chancellorsville, but it cost them the life of Stonewall Jackson. In the W. Grant had conceived the idea of taking Vicksburg, Mississippi. After various failures he at last invested Vicksburg with his army and a fleet of ironclads. The siege lasted six weeks and on July 4, 1863, the tn. was surrendered. While the siege was still in progress, the greatest battle of the war was fought at Gettys-



burg, Pennsylvania. It resulted in the decimation of the S. forces and the battle was lost, Lee retreating to Virginia.

In Sept. 1863 Bragg beat the Union forces under Rosecrans at Chickamauga in Tennessee. Then followed the battle of Lookout Mt. The Confederates retreated to Georgia. These last battles had been fought with Grant as commander-in-chief. In Feb. 1864 Lincoln made him lieutenant-general in charge of all the armies. Grant now planned to end the war. He himself would face Lee in Virginia, seek to destroy his army, and take Richmond. At the same time he would send Sherman to face Gen. J. E. Johnston in Georgia. In May 1864 began the two indecisive battles of the Wilderness of Virginia and of Spottsylvania. On June 3, 1864, the enemies met at Cold Harbor and here in less than an hour over 12,000 Union soldiers were killed or wounded. Grant had lost 60,000 men in this campaign; and the Confederates 40,000; but he knew that the S. could not replace its losses in manpower whereas the N. could. In the early autumn months Sherman won victories at Winchester and Cedar Creek and then laid waste the entire Shenandoah Valley. While Grant was fighting in the Wilderness Sherman began his march from Chattanooga. On Sept. 2, 1864, he entered Atlanta. In the meantime, in Aug. Adm. Farragut had won his famous victory of Mobile Bay, which had been the harbour for the Confederate blockade runners, a victory which destroyed the Confederate fleet. In Nov. after strong opposition in his own party, Lincoln was re-nominated for president by the Republicans and Andrew Johnson, a war Democrat from Tennessee, was nominated for vice-president. Gen. McClellan was nominated by the Democrats. Lincoln was easily re-elected. Less than two weeks after the election Sherman set out on his famous march to the sea from Atlanta. The army of 62,000 men accomplished the 300 m. journey, leaving destruction in its wake. On Dec. 21 Sherman entered Savannah unopposed. Gen. Thomas won the battle of Nashville in Dec. 1864 and thus drove the last of the Confederates out of Tennessee. In Jan. 1865 Wilmington, N. Carolina, was taken by joint naval and military action and the last remaining port of the Confederacy was closed. Sherman began his march back from the sea. Columbia was burned down, and Charleston was deserted by the Confederates. An abortive attempt at peace failed, but the end was in sight. Grant, with his superior numbers, was encircling Petersburg and Richmond. On April 2 the Union forces attacked Petersburg and captured it. At length, on April 3, 1865, the Union armies entered Richmond. Lee was completely surrounded. At Appomattox Court House on April 9 he surrendered. Johnston surrendered his army to Sherman on April 26, and by the last of May all the rest of the organised forces in the far S. had also laid down their arms.

In this costly civil war half a million

lives had been lost, while tens of thousands of soldiers returned with health permanently impaired. The public debt of the Union had risen to nearly three billion dollars. What it cost the Confederacy has never been definitely estimated. Despite all this, the N. was stronger than ever, the S. was ruined. It is perhaps true to say that, because of the vindictiveness in the post-war years, real union between the sections was not really attained until the Sp.-Amer. War when a Republican and N. president, Wm. McKinley, had the courage and inspiration to call to high command some of the last notable surviving figures of the old Confederate army.

The general rejoicing in the N. came to a sudden end when on April 14, 1865, President Lincoln was assassinated. He had been ready to accord the rebel States generous treatment; but his views did not meet with the approval of Radicals in Congress. Lincoln had been succeeded by Andrew Johnson, who maintained Lincoln's attitude towards the S. On May 29, 1865, he issued a pardon proclamation to the entire S. The only exceptions were the leaders, and most of these were promised pardon if they accepted certain conditions. Under him, too, the 13th Amendment to the Constitution, forbidding slavery in the U.S.A., was adopted. But Johnson had not reckoned with Congress, which met on Dec. 4, 1865, and at once passed a Bill for the appointment of a committee whose function was to inquire into the question of the S. states. In March they passed, over Johnson's veto, a Bill giving the Negroes full rights as citizens, and this was afterwards embodied in the 14th Amendment to the Constitution. No S. State could come back into the Union unless it ratified this amendment. Tennessee alone did so. In the autumn of 1866 came the election of a new House of Representatives and the opposition to Johnson prevailed decisively. Now the road was clear for the most malignant enemies of the S. Their plan was to keep troops in the S., enfranchise the ex-slaves, and keep the conquered section as a group of permanent Republican states. One of their Acts provided that citizens, white and coloured, taking the oath of allegiance should vote for delegates to a constitutional convention in each S. State. This 14th Amendment not only admitted the Negroes as voters, but practically disfranchised the S. white leaders. Three States, Virginia, Mississippi, and Texas, failed to come in. The other seven did so only by reason of Negro and white 'carpet-bagger' votes. To make sure that this regime would endure the 15th Amendment was adopted, denying to any State the right to disfranchise a man on account of race, colour, or previous servitude. With the bulk of the whites disfranchised, the voting was by the Negroes and by those whites who had come mainly from the N. seeking what they could loot. Those former Confederates who joined in the plunder were known as 'scalawags.' The legislatures were largely

made up of ignorant ex-slaves, and their white leaders easily procured them to pass all kinds of Appropriation Bills. The unfortunate S. States were plunged into huge debts. In the end the S. white men formed the famous Klu Klux Klan which struck terror both into the Negroes and the 'carpet-baggers.' Matters came to a climax with President Johnson, when he dismissed Stanton, his secretary for war. The House of Representatives adopted a resolution for the impeachment of the president. Johnson was saved by a single vote.

*The Growth of U.S. Big Business—The Opening of the West.*—In the presidential campaign of 1868 the Republicans chose Gen. Grant, who defeated his Democratic opponent, Horatio Seymour of New York. Grant's first administration was marked by a series of measures aimed at gagging the S., and by the *Alabama* (q.v.) affair. In 1872 Grant was renominated by the Republicans. His second term was filled with more scandals than the first. Corruption in administration was the political reflection of the licence which the industrialists were allowing themselves. The era of 'reconstruction' was the beginning of 'big business,' which in the years which followed produced J. D. Rockefeller, Andrew C. Carnegie, J. Pierpont Morgan, and others who controlled vast monopolistic enterprises. The industrialisation of the country was made possible by the rapid building of railways after the civil war had ended. The Union Pacific Railroad was completed in 1869, and the network soon spread over the whole continent. The West was opened up, and the pioneers were followed by the farmers. The disappearance of the 'Wild West' as an ever-expanding frontier, the cultivation of the land, the growth of the pop. through immigration, the development of manufactures, all contributed in the second half of the century to the phenomenal growth of cities. There was extreme wealth and extreme poverty. Labour in the factories was poorly paid, and slow to organise (see under TRADE UNIONS). The labour movement, the control of capitalistic enterprise, and the economics of agriculture formed the three major problems confronting successive presidents. In the succeeding years presidential elections turned principally upon tariffs, pensions, and the free silver issue. Grant's administration was followed by a run of three Republicans: Rutherford B. Hayes (1876); James A. Garfield (1881; assassinated 1881); and Chester A. Arthur (1881). In 1884 Grover Cleveland was elected, the first Democrat president since the Civil war. In 1888 Benjamin Harrison, Republican, defeated Cleveland when the latter ran for re-election, but in 1892 Cleveland was again elected president. William McKinley, a Republican, became president in 1896.

For years the people of Cuba had been in revolt against Sp. rule. President Cleveland had warned Spain that the U.S.A. could not look on calmly. In Feb. 1898 he sent the battleship *Maine* to Havana to guard Amer. interests. On the night of

Feb. 15 the ship was blown up and 266 of her crew lost their lives. On March 28 a naval committee of inquiry reported that the tragedy was caused by the explosion of a submarine mine. The call for war was now more insistent. On April 25 war was formally declared (see SPANISH-AMERICAN WAR).

In the presidential election of 1900 McKinley was easily re-elected, but on Sept. 6, 1901, he was shot by an anarchist and *d.* on Sept. 14. Theodore Roosevelt (1858-1919), who had been elected vice-president succeeded to the presidency. It was realised that a new era had been inaugurated. Roosevelt had made enemies of the political bosses, whom McKinley knew how to placate. In the summer of 1902 the anthracite coal region was paralysed through a strike which lasted until Roosevelt intervened and induced both sides to agree to arbitration. Roosevelt had actively taken up the matter of building the Panama Canal, when negotiations with Colombia failed. Roosevelt recognised the Panama Republic and concluded a bargain which made the construction of the canal possible (see PANAMA CANAL). In 1904 the Republicans nominated Roosevelt, who thus ran for the presidency in his own right and he was elected. In the next presidential election the Democrats nominated Bryan for the third time, but W. H. Taft (1857-1930) was elected. Congress passed another high tariff Bill, the Payne-Aldrich Act which Taft signed, although at heart he had been in favour of lower duties.

When the Republicans held their nominating convention in 1912 Taft was nominated after contesting delegations favouring Roosevelt were ruled out. Thereupon Roosevelt formed his Bull Moose (q.v.) party and ran as their candidate. Woodrow Wilson, who had been governor of New Jersey, was nominated by the Democrats. Largely due to the split in the Republican ranks, he won by an overwhelming majority. Under his impulsion in his first term Congress passed the Underwood Act, which greatly lowered the tariffs; a finance Bill, which took the control of the nation's finances out of the hands of Wall Street and placed it under the Federal Reserve Banks; and a Bill placing Amer. on an equality with foreign vessels in the matter of Panama Canal tolls. In 1916 Wilson was renominated and defeated Charles E. Hughes, the Republican nominee. When the First World War broke out Wilson called upon the people to be neutral, but on April 6, 1917, the U.S. entered the war against Germany. (See WORLD WAR, FIRST.)

*The U.S.A. between the Two World Wars.*—When the Peace Conference opened on Jan. 18, 1919, Wilson broke all precedents by attending as head of the Amer. delegation. The draft Treaty did not meet with his approval, but he yielded because the Covenant of the League of Nations (q.v.) was interwoven with it and he believed that these articles could mitigate the rest. He returned to advocate its adoption by the U.S. Senate, but met

increasing opposition. The treaty was eventually rejected by the Senate.

In 1920 a group of Republican Senators and bosses secured the nomination of Senator Warren G. Harding for president. The Democrats nominated James M. Cox, governor of Ohio, but Harding was elected by a large majority. The most creditable achievement of Harding's administration was the calling of the arms conference at Washington in Nov. 1921. Congress passed a Bill limiting immigration into the country and starting the quota system (*see* IMMIGRATION). In Sept. 1922 the Fordney-McCumber Tariff Bill was passed, its new feature being that the President had power to lower or raise duties on the advice of the Tariff Commission. The regime was darkened by some grave scandals, which brought the administration into disrepute.

After Harding's death Vice-President Calvin Coolidge was sworn in as President. He was nominated for the presidency in his own right, in 1924 and the Democrats nominated J. W. Davis, who had been ambas. to Britain. Coolidge was elected. His policy was to interfere with business as little as possible, economise the nation's money, and reduce taxes and national indebtedness. These things he accomplished. Coolidge secured substantial cuts in the income tax rates. During Harding's brief term the U.S.A. had made arrangements for the refunding of Great Britain's war loans from the U.S.A. Under Coolidge similar contracts were made with France and Italy. In Jan. 1926, at the persuasion of Coolidge, the Senate voted to have the U.S.A. adhere to the World Court (*see* INTERNATIONAL JUSTICE, PERMANENT COURT OF), but made the action abortive, because it added reservations which the other signatory powers refused to accept. In 1927 Coolidge sent D. W. Morrow to Mexico, and he succeeded in effecting a settlement of all outstanding questions between the two countries. In the same year Aristide Briand, Fr. Foreign Minister, proposed to Secretary of State T. B. Kellogg that the U.S.A. and France agree upon a treaty renouncing war between them and agreeing to settle all disputes by pacific method (*see* KELLOGG PACT). In 1928 Coolidge was succeeded by Herbert C. Hoover. As the result of conversation between MacDonald, the Brit. Prime Minister, and Hoover a Naval Disarmament Conference was arranged which eventuated in the treaty of April 22, 1930 (*see* under LONDON CONFERENCE (1930)). But everything that happened in Hoover's term faded into insignificance in comparison with the acute economic crisis which started with the great New York Stock Exchange slump in the autumn of 1929. Hoover at first attempted to meet the crisis by a policy of 'business as usual' and to prevent a fall in wages. Orthodox methods were however, insufficient. In 1930 the congressional elections went heavily in favour of the Democrats, as did the governors' elections. The financial plight of the nation occupied public attention during the next two years almost to the

exclusion of all other matters. Unemployment increased to over five millions. Export trade declined largely as a result of worsening conditions in Europe, and it was in the hope of reviving trade with Europe that President Hoover proposed in June 1931 a moratorium for one year on the repayment of both principal and interest on all war debts. This was at first successful, but large withdrawals of gold by European banks which had deposits in the U.S.A. caused a serious drain on the Amer. gold reserve. Congress approved the moratorium but recorded disapproval of any proposal to reduce or cancel war debts. Early in 1932 Congress accepted Hoover's proposal to set up a Reconstruction Finance Corporation as a means of helping industry through the slump, but this measure, though it served a useful purpose, did not, however, prevent the decline in popularity of President Hoover's Administration. The result was a landslide in the Democratic favour at the Presidential elections in the autumn of 1932. Franklin D. Roosevelt, the Democratic candidate, gained a popular vote of 22,813,786, which carried forty-two States possessing 472 votes in the electoral college. The Democrats also gained a majority in the Senate and increased their previous majority in the House of Representatives.

Roosevelt assumed office on March 4, 1933. The first year of his administration was almost wholly taken up with measures to combat the depression and to bring into effect the 'New Deal' (*q.v.*) which he had promised the nation. The Economy Act of 1933 was one of the first measures and was designed to separate emergency spending to meet the depression from the normal budget under which expenditure was reduced. Prices were given an upward trend by 'controlled inflation,' and the export of gold abroad was forbidden except under licence, thus taking America off the gold standard. Spending power was increased when employers pledged themselves under the National Industrial Recovery Act (June 1933) to raise wages and increase employment. Under this Act a National Recovery Administration was set up, with Brig.-Gen. Hugh S. Johnston at its head, to encourage higher wages and prevent unemployment. A code limiting hours of work and setting a minimum to wage rates was adopted by many employers. Agriculture was similarly helped by the Agric. Adjustment Act (May 1933), by which commodity prices were raised and overproduction which was a cause of depression reduced. This year (1933) is also to be remembered as bringing the Prohibition experiment to an end. The Congress elected in 1934 showed further Democratic gains. Its first consideration was the labour trouble which had arisen as a result of the National Recovery Administration. The latter was brought to an end the following year by a decision of the U.S. Supreme Court to the effect that it was unconstitutional. Shortly afterwards (1936) the Supreme Court ruled that the Agric. Adjustment Act was

also unconstitutional. There remained, the Farm Credit Administration, also set up in 1933 as part of the New Deal plan for agriculture. This continued the work of the Federal Farm Board, estab. by President Hoover. With the end of the Agric. Adjustment Act, however, production could no longer be controlled, and in 1936 President Roosevelt dealt with the problem in another way by the Soil Conservation and Domestic Allotment Act. Grants to farmers were made conditional on their making the best use of their land and preventing soil erosion.

As a result of the setbacks which the New Deal had received at the hands of the Supreme Court, Roosevelt embarked on a 'Second New Deal,' strengthened by his re-election to a second term in 1936. Roosevelt at once set about the reform of the Supreme Court, but the Bill was rejected by Congress. The senior justice resigned, however, and was replaced by one more sympathetic to the New Deal. Roosevelt's second term began with a business 'recession,' of which excessive gov. expenditure was said to be the cause. There were, however, signs that business was deliberately curtailed in order to keep a high price level. A Monopoly Investigation was authorised by Congress, and the anti-trust laws were revived. To assist agriculture a new A.A.A. was passed in 1938. Opposition to the New Deal had grown, and the Republicans increased their representation in Congress after the mid-term elections (1938). The policy of the New Deal was conducted against a background of foreign affairs which became increasingly disturbed. The World Economic Conference held in London in 1933 had broken down largely through the Amer. preference for economic isolation. In spite of this a Trade Agreements Act was passed in 1934, allowing the president to negotiate treaties for the mutual reduction of tariffs up to a maximum of fifty per cent. With this mandate, Cordell Hull (q.v.), the secretary of state for foreign affairs, successfully concluded a number of treaties, particularly with Great Britain, Canada, and the countries of S. America. The Latin-Amer. treaties were a facet of the 'good neighbour' policy to which the president gave expression at an Inter-Amer. Conference for Peace held in Buenos Aires in 1936.

The Amer. attitude to the possibility of war in Europe was shown by the passing of three Neutrality Acts in 1935, 1936, and 1937. (See NEUTRALITY, *American Neutrality Legislation*.)

In April 1939 President Roosevelt tried to remove the threat of war in Europe by a fruitless appeal to Hitler. Congress, however, rejected the president's proposal to amend the Neutrality Act, which was not in fact revised until Sept. 1939. It then became permissible for the U.S. to sell arms to those nations able to pay for them in cash and to transport them in their own or other non-Amer. ships. There was still a strong isolationist feeling, but Canada was already at war, and there was the prospect of Great Britain continuing

the war from there if the U.K. were overrun. The U.S.A. and Canada entered upon joint measures of defence. A Permanent Board of Defence was set up with F. H. La Guardia, mayor of New York, at the head of the U.S. delegation. Two years earlier Roosevelt had promised Amer. aid if Canada were invaded, and this was consistent with the Monroe Doctrine (q.v.). The common ground of both isolationists and interventionists was the need to rearm the U.S. and re-equip its forces. By the autumn of 1940 the U.S. was practically on a war footing. A National Defence Advisory Committee had been set up in May, which was later replaced by an Office of Production Management of which W. S. Knudsen was director-general. For the first time in Amer. hist. military conscription was introduced in peacetime. The president showed that preparedness transcended politics and in June 1940 appointed two Republicans, H. L. Stimson and Franklin Knox, to the posts of secretary of state for war and for the navy respectively. Amer. sympathy was on the side of the Allies, and the Battle of Britain encouraged the U.S. to send all aid to Great Britain 'short of war.' A valuable measure of aid (Sept. 1940) was the transfer of fifty destroyers from the U.S. to the Brit. navy in return for a ninety-nine year lease of bases in Newfoundland, the Bahamas, Jamaica, and elsewhere in the W. Indies. With the fall of France and the Netherlands, the U.S. warned Germany that the transfer of colonies in the W. hemisphere from one non-Amer. power to another would not be tolerated. As a consequence a Pan-Amer. Conference began (July 21, 1940) to consider moves to withstand any Ger. effort to gain control of Fr. and Dutch ters. in S. America.

The year 1940 was election year. Both Republicans and Democrats supported the president's foreign policy and were united in the wish to hasten Amer. preparedness. The election was therefore fought on domestic issues. Roosevelt, departing from tradition, was nominated for a third term. Roosevelt gained a larger majority than anticipated, polling approximately 27,000,000 votes against Willkie's (q.v.) 22,000,000. Roosevelt's entry upon a third term was marked by the Lend-Lease (q.v.) Act, which was presented to Congress on Jan. 6, 1941, and became law on March 11. In spite of anti-Russian feeling, Lend-Lease credits were granted to Russia after the Ger. invasion on June 22. By that time Roosevelt had declared a 'state of unlimited national emergency' (May 27). Amer. expeditionary forces were sent as a protective measure to Greenland, Iceland, Dutch Guiana, and elsewhere. On Aug. 14, the terms of the Atlantic Charter (q.v.) were announced, following a secret meeting between President Roosevelt and Mr. Churchill on a battleship in mid-Atlantic. The Amer. defence policy was hindered by labour disturbances during the year (1941), particularly by the coal strike in Oct., led by John L. Lewis (q.v.), who thereby

won his fight for a closed shop (q.v.). There was considerable agitation for anti-strike legislation, but the president was against this.

*The Entry of the U.S.A. into the Second World War.*—Meanwhile, Japan's adherence to the tripartite Pact with Germany and Italy was giving concern in Washington. The Trade Agreement with Japan had lapsed (Jan. 26, 1940), and had not been renewed. During 1941 relations became critical after the Jap. occupation of Siam (Aug. 1941). Diplomatic conversations were conducted in Washington between the president and the Jap. ambas. Adm. Nomura, aided by the special envoy, Mr. Kuruu, sent by the Jap. premier, Gen. Tojo. Behind this diplomatic screen, Japan prepared for war, and on Dec. 7, 1941, struck from the air against the Amer. naval base at Pearl Harbour (q.v.), Hawaii, crippling the U.S. Pacific Fleet, and giving Japan naval supremacy. On Dec. 11 Germany and Italy also declared war on the U.S. Shortly afterwards Churchill went to Washington to confer with the president. Pearl Harbour was followed by an attack on the Philippines, Hong-Kong, and the Malay Peninsula. The Philippines were occupied by the Jap. by the end of May, 1942. The effect was to release a tremendous production drive, and this was encouraged as the year progressed by naval successes in the Coral Sea and off Guadalcanal (see NAVAL OPERATIONS IN SECOND WORLD WAR).

Various boards were created to further the war effort, notably the War Production Board with Donald Nelson as chief executive, and the Economic Stabilisation Board with J. F. Byrnes at the head. The aim was to create an armed force of ten million men, but the drafting of recruits caused a shortage of labour in industry. In April 1943 the president announced an economic programme to stabilise the cost of living. The Emergency Price Control Act was followed by an order issued by Leon Henderson, head of the Office of Price Administration, fixing maximum retail and wholesale prices. In spite of war taxation, increased income tax, and the increase in the National Debt, inflation became a problem. This was met by the Anti-Inflation Act, designed to fix the level of wage rates as in Sept. of that year. In Europe the U.S. maintained diplomatic relations with the Fr. Gov. at Vichy, but supported the occupation of Madagascar by the Brit in May 1942. The U.S. landings in N. Africa followed in Nov. under the command of Lt. Gen. Eisenhower (see AFRICA, NORTH, SECOND WORLD WAR CAMPAIGNS IN). The next stage in war diplomacy was the conference at Casablanca (q.v.) in Jan. 1943, the first time in the hist. of the U.S. that the Amer. president was away from the country in wartime.

The Congressional elections in 1942 had resulted in Republican gains, and this marked a growing opposition to the liberal tendencies of the Roosevelt administration. The Anti-Inflation Act of 1942 was swept away, and efforts to control

spending and to tax war profits were rebuffed. The cost of living rose sharply, bringing protests from organised labour. The coal strike of May 1943 was the occasion of anti-strike legislation passed hurriedly over the president's veto. Domestic conflicts, sharpened by the approach of the presidential elections in 1944, did not, however, seriously hamper the war effort. In foreign affairs Roosevelt's prestige was high. After his return from the Teheran conference, Roosevelt in his ann. message to Congress (Jan. 11, 1944) called for a National Service Law, backed by laws to tax war profits, control the cost of food, and stabilise prices. Congress was not responsive. It was not until July, however, that Roosevelt announced that he would stand for a fourth term. By that time domestic policy receded before the events in Europe, following the Allied invasion in France in June. It was against this background of war that the election was fought. Roosevelt was renominated, with Senator Truman as the vice-presidential candidate in place of Henry Wallace (q.v.). The Republican candidate was T. E. Dewey (q.v.), Governor of New York. In the elections in Nov. Roosevelt's popular vote was 25,610,946 and Dewey's 22,018,177. Foreign policy had been kept outside party politics, and no political capital was made out of the not very successful outcome of the conference at Dumbarton Oaks (q.v.). When the new Congress met in Jan. 1945, Senator Vandenberg (q.v.), the Republican leader, gave the Dumbarton Oaks plan his support. Then followed the conferences at Yalta (q.v.) between President Roosevelt, Mr. Churchill, and Marshal Stalin. Meanwhile, the U.S. and the Latin-Amer. countries had confirmed Amer. solidarity in a declaration of mutual assistance, known as the Act of Chapultepec (March 6, 1945). Soon after the Yalta Conference, invitations were issued by the U.S., Great Britain, and the U.S.S.R., to fifty-one nations to take part in a conference to be held at San Francisco to discuss the future of the world organisation sketched out at Dumbarton Oaks. The opening of the conference on April 25 was overshadowed by the death of Roosevelt. Harry S. Truman, vice-president, succeeded to the presidency. The U.S. delegation, as nominated by Roosevelt, consisted of representatives of both the Democratic and Republican parties and some independent representatives. (See SAN FRANCISCO CONFERENCE.)

While the conference was in session, there came the news of the surrender of Germany on May 7. The collaboration of the U.S. with Great Britain, the U.S.S.R., and France in the control of Germany emphasised the need for amicable relations, particularly between the U.S. and Russia. President Truman despatched Harry Hopkins (q.v.) to Moscow. This paved the way for the meeting of Truman, Churchill, and Stalin at the Potsdam Conference (q.v.). On July 28 the Senate ratified the U.N. Charter (q.v.) by 90 votes to 2. It seemed that isolationism as a political force was

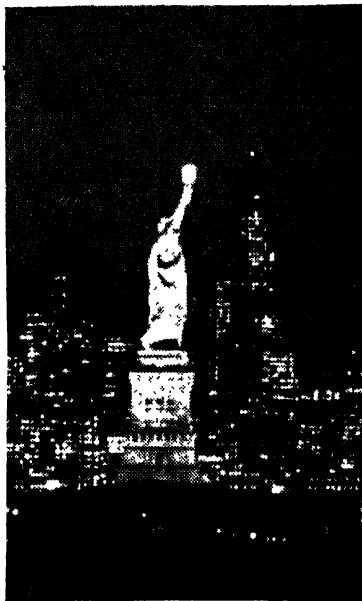
ended. The Senate also ratified the Bretton Woods Agreement (q.v.), and decided that the U.S. should take part in the United Nations Food and Agriculture Organisation (q.v.). By Oct. 24, Byrnes, who had succeeded Stettinius (q.v.), as secretary of state on June 30, was able to announce that all the necessary ratifications had been received. The Charter of the United Nations Organisation was now law.

Meanwhile, in the Far E. the atomic bomb (q.v., also HIROSHIMA and NAGASAKI), was instrumental in causing the surrender of Japan. The war was at an end, but the atomic bomb figured largely in the problems of peace; controversy over the control of it broke out at once. A Congressional Committee was set up resulting in the MacMahon Bill, which became law on Aug. 1, 1946, establishing control by means of a civilian Atomic Energy Commission. In Nov. President Truman held a conference in Washington with the prime ministers of Great Britain and Canada, and by agreement with them the problem of control was put to the United Nations.

*The U.S.A. after the Second World War.*—The end of the war also posed the question of the continuation of the Lend-Lease Act. On Aug. 21, 1945, Truman had announced that all outstanding contracts for Lease-Lend were cancelled unless the govs. concerned were willing to pay either in cash or by credit arrangements. As a result Lord Keynes and Lord Halifax headed a Brit. mission to Washington to discuss financial relations between the two countries. On Dec. 6, a final settlement was reached, the U.S. cancelling \$25,000,000 and granting a loan of \$650,000,000 to cover goods under contract or on the way. In addition, the Brit. mission negotiated a loan of \$3,750,000,000 (about £937,500,000) at 2 per cent interest repayable in fifty ann. instalments beginning in 1951.

In domestic affairs the struggle between management and labour was renewed. Trade union membership had increased during the war, and attempts to reduce wartime wages or at least to resist any increase although prices remained high, were met by a series of strikes during 1945 and 1946 in the coal, automobile, steel, and electrical industries. Wages were bound up with prices, and the country was divided on the question of price control. The Price Control Act lapsed in June 1946, and by the end of the year the president had reluctantly to give way to the public agitation for the removal of controls. All controls were swept away except for those on rent, rice, and sugar. Against this domestic background of labour disputes, rapid demobilisation, and sometimes violent readjustment to peacetime conditions, U.S. foreign policy was conducted with the support of Republicans and Democrats alike. The secretary of state, Byrnes, represented the U.S. at a series of international conferences beginning with the General Assembly of the United Nations in Jan. 1946, and ending with the Peace Con-

ference in Paris from July to Oct. Amer. foreign policy was largely united by doubt of Russia's intentions. Reacting from the unfavourable reception given by the U.S.S.R. to his plans for Four-Power control of Germany for twenty-five years, Byrnes in a speech at Stuttgart on Sept. 6 spoke in terms of Ger. unity and co-operation with the W. Henry Wallace,



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#### NEW YORK HARBOUR

The Statue of Liberty on Bedloe's Island: behind it is the financial district of the city. The statue was constructed in Europe by Bartholdi, and brought to the U.S.A. in 1885, being erected the following year. It measures 305 ft 6 in. from the foundation of the pedestal to the torch, and weighs 225 tons.

U.S. secretary of commerce, denounced Byrnes's policy of resistance to Russia in the interests, as he averred, of Brit. imperialism, and resigned his office. This controversy aggravated the difficulties which the Democratic Party had to face in the Congressional elections in Nov. The Republicans gained a majority in both the House of Representatives and the Senate, the first Republican majority in Congress since 1930. In foreign affairs relations with Russia continued to occupy the State Dept. Early in the new year Byrnes was succeeded as secretary of state by Gen. George C. Marshall (q.v.). Events in Greece provided the occasion for an important speech by the president on March 12, calling for Amer. aid to Greece

and Turkey, and laying down the policy, later known as the Truman Doctrine, of helping any country in danger of submission to a Communist regime. In May \$350,000,000 dollars authorised for relief work through U.N.R.R.A. (q.v.), was taken over to be administered direct by the U.S. gov. itself in Europe and China. The way was thus prepared for the most significant event of the year, the speech by Gen. Marshall at Harvard Univ. on June 5, 1947, advocating U.S. aid to enable Europe to recover its normal economy. The speech was recognised as an invitation to the countries of Europe to examine their needs and concert a plan of development which Amer. magnanimity would make possible. The foreign ministers of the United Kingdom, France, and the U.S.S.R. met in Paris in June to discuss Gen. Marshall's offer. Russian participation was later withdrawn. In spite of this a conference on European economic co-operation opened in Paris, and as a result of its recommendations the Economic Co-operation Bill was passed by Congress in April the following year. (See EUROPE, *European Recovery Programme*; also ORGANISATION FOR EUROPEAN ECONOMIC CO-OPERATION.)

Meanwhile, the administration was at odds with Congress over its budget proposals earlier in the year (1947). Congress proposed a greater measure of tax reduction than the president considered safe in view of the possibility of inflation, but the congressional proposals were successfully vetoed. The president's veto was, however, unable to prevent anti-labour legislation, contained in the so-called Taft-Hartley Act, passed over the veto in June 1947. It imposed *inter alia* a period of notice before strike action or lock-out, banned the 'closed shop,' and restricted the Unions' powers of compulsion over their members. Union funds were not allowed to be used for political purposes, and if Unions wished to take advantage of the National Labour Relations Board they had first to certify that their officials were not Communists. Events in Europe, particularly the Communist *coup d'état* in Czechoslovakia in Feb. 1948, gave considerable impetus to the project for aid to Europe. In June the Senate adopted a resolution proposed by Senator Vandenberg, with the intention of giving aid to Europe in defence as well as in economic affairs, and thus admitting the possibility of regional defence pacts within the framework of the United Nations Charter. Both the Republican and Democratic parties supported President Truman's foreign policy, which was not therefore an issue in the presidential election due to take place later in the year (1948). At the Democratic convention in July Mr. Truman was nominated, but with no general conviction of success on the part of his supporters. Representatives of the S. States withdrew their support on account of Truman's civil rights programme, and they nominated a Democratic candidate of their own, Thurmond, governor of S. Carolina. Dewey was again nominated as Repub-

lican candidate and the general expectation was that he would win the election. Truman, himself confident, confounded the prophets by polling 24,104,836 votes in the popular ballot against 21,969,500 for Dewey. Voting for Thurmond was 1,169,312 and for Wallace 1,157,100. These results gave Truman an overwhelming majority in the electoral college. The party position in both houses of Congress was reversed, the Democrats gaining a majority. The results put the President in a position to launch his 'Fair Deal' programme, which included the repeal of the Taft-Hartley Act (which repeal labour felt it had earned by its strenuous political support for the Democrats), and the introduction of civil rights legislation. He was, however, disappointed by the unwillingness of Congress to embark on either of these measures during 1949, and in fact legislation on civil rights was postponed indefinitely.

Meanwhile, in foreign affairs, the Vandenberg Resolution provided the initiative for consultations between the U.S. and the five Powers (the United Kingdom, France, the Netherlands, Belgium, and Luxembourg), which on March 17, 1948, had signed the Brussels Treaty (q.v.) of mutual assistance. Other countries (Italy, Portugal, Denmark, Norway, and Iceland), were invited to participate, and these ten countries with the U.S. and Canada concluded the North Atlantic Treaty (see NORTH ATLANTIC PACT), which was signed in Washington on April 4, 1949. This made the U.S. a party to the defence plan of W. Europe, and the next step was the Mutual Defence Assistance Act which was signed by President Truman on Oct. 6, 1949. This authorised an expenditure of 1,100 million dollars on military supplies to W. Europe in support of a co-ordinated defence plan which was to be worked out. The passage of the second year's appropriations for the Marshall plan, acceptance of the N. Atlantic Treaty and the Mutual Assistance Act were features of a constructive foreign policy which afforded significant evidence of continued appreciation by both parties of the new position of the U.S.A. in world affairs.

There was a steady fall in industrial production between Oct. 1948 and the late summer of 1949, and unemployment reached a total of more than 3,700,000, and certain especially distressed areas were given preference in federal contracts to reduce unemployment. The economic position was further aggravated by a prolonged strike of the steel-workers, whose aim, which was successful, was to secure a pension scheme comparable with that won earlier by the coal-miners. The steel-workers' victory encouraged other unions to press for pensions of \$100 a month at 65, and also prompted other companies, notably the Bell Telephone System, to follow the Ford Automobile company in granting similar pensions. Another domestic problem was that caused by the presence of Communists in labour unions

schools and universities, and gov. service.

On Jan. 27 (1950) the Mutual Defence Assistance Agreement between Britain and the U.S.A. under the N. Atlantic Treaty was signed in Washington and came into force immediately. Similar agreements were signed between the U.S.A. and France, Italy, Denmark, Norway, Belgium, the Netherlands and Luxembourg. In the same month President Truman announced that he had decided to instruct the Atomic Energy Commission to continue its work on the hydrogen bomb. This announcement was made necessary by the spate of controversy during the previous few weeks on the subject of the bomb, but apparently it was interpreted to mean not a positive decision to manufacture, or begin to manufacture, the bomb, but merely not to stop development and experimentation.

The economic situation improved after Oct. (1949) and at the turn of the year there was a marked if short-lived boom, unemployment being appreciably reduced. In June 1950 there were 3,200,000 unemployed. Then came the sudden Korean crisis and on July 19, President Truman, in his message to Congress, asked for \$10,000,000,000 for the Amer. armed forces and said he would request further sums for military aid to the Atlantic Pact Powers and other nations vital to Amer. security. He also reported to Congress that he had authorised the secretary of defence to call up as many men as might be needed and he asked for the statutory limits of the strength of the armed forces to be removed.

At this time the American industrial machine was running at a record rate. Action was, however, necessary to prevent inflation. The president recommended legislation to estab. priorities and allocate materials and to limit the use of materials for non-essential purposes. He also asked for heavier taxes to meet as much as possible of the new expenditure from taxation.

**The Korean War (1950).**—On June 25 Communist forces of N. Korea crossed the 38th parallel and launched an aggressive attack against the republic of S. Korea. President Truman announced that Amer. forces would intervene and immediately afterwards the Security Council of the United Nations decided to invoke military sanctions against the aggressors (see UNITED NATIONS, CHARTER OF 1945). Brit. and Australian naval and air forces were placed at the disposal of Gen. MacArthur (q.v.) who assumed command, provisionally, of all United Nations forces. Seoul soon fell to the invaders and MacArthur was authorised by President Truman to use supporting ground units. A naval blockade of the Korean coast was ordered and the U.S. air force attacked targets in N. Korea. British naval and Australian air support was soon forthcoming. At the same time the Seventh U.S. Fleet was placed between Formosa (then in the hands of the Chinese Nationalists) and the mainland of China to prevent further acts of aggression against

that is, by organised Communist troops. It was early recognised by the U.S. gov. that the conflict was likely to be

were equipped with Russian tanks (some of 60 tons), guns, and planes, and in the first few months the N. Koreans made steady advances. Pending the build up of the U.N. forces the strategy of the defence was to fight a delaying action in the hope that invincible support would gradually come from the Amers., operating as agents of the United Nations, before the whole of S. Korea was overrun. With a hard nucleus of large tanks, the impetus of the invasion was, in the first weeks, irresistible. N. Korean forces were estimated to be fifteen divs. of between 5000 and 6000 men each, engaged in an advance on the W. side of the central mt. range. By the capture of Seoul and Suwon the invaders possessed themselves of the two prin. junctions in that part of the fighting area together with the airfield of Kimp'o W. of Seoul. With Brit. Commonwealth squadrons available to co-operate with the Amer. fleet, however, the N. Koreans could not dispute the command of the sea. The U.S. Gov. (July 7) then ordered the use of conscription as a first step to bringing its armed forces to the strength deemed necessary for the war. On the same date proposals put forward by the Brit. and Fr. for a unified command of all forces fighting in aid of S. Korea were approved by the Security Council of the United Nations by seven votes to none (with 3 abstentions), and Gen. MacArthur was formally appointed to lead the United Nations forces. During June-July the United Nations troops were driven farther S., eventually centering their defence on Taegu, in positions extending over a perimeter of 125 m. from Pohang to Pusan. In July they received armoured reinforcements. On Sept. 14 Amer. troops were landed behind the Communist lines at Inchon, in a major United Nations counter-offensive. Landings were made at sev. other points on the occupied coast, and other troops advanced N. from the Pusan perimeter. Troops in the N. had captured Seoul by the end of Sept. and had linked up with forces advancing from the S., via Sangju, while Brit. units mopped up pockets of stiff N. Korean resistance around Songju. It was estimated that 100,000 N. Koreans had been trapped in the Seoul-Sangju-Taegu pocket.

**AMERICAN LITERATURE.**—There are in early Amer. literature many sermons, and letters, but these are mainly of historical interest. But with the eighteenth century the literature of America begins to strike a more distinctive note. Two great Puritan divines are notable in the early part of the century. The first is Cotton Mather (1663-1728), whose learned and able, if somewhat ill-arranged, *Magnalia Christi Americana* (1702) is of great historical and theological importance. The other is Jonathan Edwards (1702-58), whose exposition of the Calvinistic conception of the universe (in the *Freedom of the Will*, 1754, and the *Treatise on Original*



*Sin*, 1758) is the ablest setting forth of that system of theology. Benjamin Franklin's (1706-90) works are notable as the expression of a manly and vigorous personality. His *Autobiography* (pub. 1817) is plain-spoken and self-revealing to an unusual extent and the earliest masterpiece of U.S. literature. His style is a model of plain yet forcible prose. Literature produced in Virginia was of a lighter kind, written largely by men of faction and dealing with the hist. and geography of their part of America. John Woolman's *Journal* (1774), one of the finest Quaker books, received high praise from Lamb. A naive and refreshing book, praised by Hazlitt and Lamb, is St. John de Crevecoeur's *Letters of an American Farmer* (1782), which describes life and customs in the colonies. Philip Freneau (1752-1832), one of the best of the early poets, helped the cause of Amer. independence by satire and song. Later, John P. Kennedy (1795-1870) became the precursor of all S. plantation fiction with his *Swallow Barn* (1832), depicting life on a Virginian estate. Charles B. Brown (1770-1810) was a successful writer of the Gothic novel. One of the greatest names is that of Washington Irving (1783-1859). His first great success was his *Knickerbocker's History of New York* (1809), written in a vein of delightful humour. His *Sketch Book* (1819) included 'Rip Van Winkle,' perhaps the most widely read of his writings; also his delightful 'Legend of Sleepy Hollow.' Fenimore Cooper (1789-1851), passed a part of his boyhood among the Red Indians, and what he saw sunk deeply into his mind. This served as the inspiration for his novels. Among them may be named *The Last of the Mohicans* (1826), *The Pathfinder* (1840), and *The Deerslayer* (1841). Though his writing is unequal, he was possessed of the highest narrative gifts.

Wm. Cullen Bryant (1794-1878) was one of the earliest of America's poets. The poetry of his mature years is distinctively Amer. in its subject-matter, and individual in its treatment. He had fine descriptive powers, although he never fully realised the promise he gave in *Thanatopsis* (1817), his finest and best-known poem. Edgar Allan Poe (1809-49) is famous both as poet and writer of short stories. His influence on the short story may be compared with that of Turgenev or Dickens on the novel. His tales include *The MS. found in a Bottle* (1831), *The Fall of the House of Usher* (1839), and *Tales of the Grotesque and Arabesque* (1840). These are the products of a prodigal imagination. His poems are distinguished by charm of melody, power of lyric expression, and a command of lyric form. One of the best known abroad of America's poets is H. W. Longfellow (1807-82). Among his early vols. of verse pub. were: *Voices of the Night* (1839); *Evangeline* (1847); *Golden Legend* (1851). In 1855 *Hiawatha* appeared, and in 1858 *The Courtship of Miles Standish*. *Tales of a Wayside Inn* were pub. in 1863 and in 1867-70 a trans. of Dante. Longfellow had a command of

metre, and his metrical effects are often both striking and agreeable. Hardly inferior to Longfellow's are the poems of J. G. Whittier (1807-92), the Quaker poet. His early vols. include: *Lays of My Home* (1843); *Songs of Labour* (1850); *The Panorama* (1856). His great success came with *Snowbound* (1866). This is his masterpiece, having descriptive vividness of idyllicity of phrase. Longfellow was succeeded as prof. at Harvard by J. R. Lowell (1819-91), who had early dedicated himself to poetry, and in 1841 pub. *A Year's Life*. In 1848 came *The Vision of Sir Launfal*, and in the same year appeared *The Biglow Papers*. His poetry is distinguished by a strong reforming and ethical bias. Lowell is also an essayist of great distinction. Another writer of both verse and prose is O. W. Holmes (1809-94). The works of Holmes most widely read to-day are the *Breakfast Table* series of essays, *The Autocrat* (1858), *The Professor* (1860), and *The Poet* (1872). He also wrote some novels, and many poems are included in the vols. of essays. His essays have a lively humour, powers of keen satire, particularly on the Calvinists, tenderness, and grace. His poems have a graceful charm, the best-known being *The Chambered Nautilus*, and *The Last Leaf*.

The original genius of R. W. Emerson (1803-82) was a powerful force in the hist. of nineteenth-century thought and literature. His first pub. of note was *Nature* (1836), which was not well received by the public, but the value of which was clearly seen by Carlyle. His chief works are: *Essays* (two series, 1841 and 1844); *Representative Men* (1850); *English Traits* (1856); *The Conduct of Life* (1860); *Society and Solitude* (1870), and a vol. of poems. His transcendental philosophy is expressed in a style at once illuminating, arresting, vivid, and impassioned. His message to the ages is expressed in all his work, but is to be found practically complete in the essays on *Nature*, *Self-Reliance*, and *Compensation*. Emerson's friend, H. D. Thoreau (1817-62), ranks inferior only to Emerson as a transcendental writer and thinker. His greatest and best-known work is *Walden, or Life in the Woods* (1854), but he also wrote other vols. of description and essays such as *A Week on the Concord* (1849), *Miscellanies* (1849), etc. His works, reflecting the man, are full of whimsicality, eccentricity, and sudden excursions into philosophical ground, and are pervaded like Emerson's with a strong ethical sense. John Burroughs (1837-1921) may also be mentioned. His three great inspirations were Emerson, Walt Whitman, and Matthew Arnold. Burroughs's first book was *Walt Whitman as Poet and Person* (1867), but he is more significant as a naturalist, and his many books dealing with nature and animal life are full of original observation, and are distinguished by simplicity of style. The most revolutionary figure in Amer. literature is Walt Whitman (1819-92). It was not till 1855 that his first really great book *Leaves of Grass* appeared. His later poems include

*Drum-Taps* (1865), a record of his work as a nurse in the Civil War. He wrote in prose *Specimen Days in America* (1882), and *Democratic Vistas* (1871). Whitman has been called 'the first democrat.' He was supremely conscious of his dignity as the mouthpiece of democracy. His verse is unrhymed and free; it has a swinging energy. Other nineteenth-century poets of America are Bayard Taylor (1825-78), who in addition to many fine lyrics made a well-known trans. of Goethe's *Faust*; C. G. Leland (1824-1903), translator of Heine and author of *Hans Breitmann's Ballads* (1914), and Joaquim Miller (1841-1913), author of *Songs of the Sierras* (1871). One of the best poets of the S. was Sidney Lanier (1842-81), author of *The Symphony* (1875). Paul H. Hayne (1830-86), and Henry Timrod (1828-67), were also notable S. lyrists. Now recognised as one of America's greatest poets is Emily Dickinson (1830-86), whose individual poetry is important for its own beauty and as a forerunner of the later poetic movement, Imagism.

Among the really great novelists is Nathaniel Hawthorne (1804-64). His stories were written as interludes in a busy diplomatic career. His greatest works are: *The Scarlet Letter* (1850), *The House of the Seven Gables* (1851), and *The Marble Faun* (1860), together with his stories for children, *A Wonder Book* (1852) and *Tanglewood Tales* (1853), and his short stories in *Twice-Told Tales* (1837), and *Mosses from an Old Manse* (1846). He had a perfect feeling for form and for the narrative unities, and is thus in a sense classical, though his prevailing temper is romantic, in his power to feel the glory and beauty of the New England past. By many Herman Melville (1809-91) is considered the greatest Amer. novelist. His *Moby Duck* (1851) is a great prose epic of the sea, and in *Typee* (1846) and *Omoo* (1847) he took the S. Seas for a subject long before they were discovered by any other writer. Though Harriet Beecher Stowe (1811-96) wrote many novels, she is best known by *Uncle Tom's Cabin* (1851-52). Later great Amer. fiction writers are Bret Harte (1839-1902), and his fellow-humorist 'Mark Twain' (Samuel Clemens, 1836-1910), whose *Life on the Mississippi* (1883), and *The Adventures of Huckleberry Finn* (1884) are masterpieces. Henry James (1843-1916) is one of the greatest novelists of the second half of the century, but in his essence he was really more of a European than an Amer. writer. Wm. Dean Howells (1837-1920) was the founder and head of the realistic school, paying scrupulous attention to detail, deriving something of its method from the Russians. Mary E. Wilkins (Mrs. C. M. Freeman, 1852-1930), was an important member of this group. Frank Norris (1870-1902), who lived to complete only two books of his projected trilogy of the 'epic of the wheat,' is one of the most significant of sociological novelists. He has sometimes been compared to Zola, while David Graham Phillips (1867-1911), owing to his comprehensive outlook on

Amer. life, has been called the 'American Balzac.' With Norris is often associated Stephen Crane (1871-1900), whose *The Red Badge of Courage* (1895) estab. the 'naturalism' of the 'nineties. Thomas Nelson Page (1853-1922), is the author of some striking stories of Virginian life, while George Washington Cable (1844-1925) made Louisiana his own particular field. His *Old Creole Days* (1879), is one of the outstanding books of short stories by Amer. writers writing on Amer. subjects. Frank Stockton (1834-1902), author of *The Lady or the Tiger?* (1882), was a master of humorous narrative.

A field in which Americans have been conspicuously successful from the first is the short story (see SHORT STORY). Irving, Hawthorne, Poe, Harte, James, Edith Wharton, are masters of international reputation in this medium. Edward Everett Hale (1822-1909) is famous for a single short story, *A Man Without a Country* (1865). A new school of short-story writers developed since the nineteenth century. The founder of this school was 'O Henry' (William Sydney Porter) (1867-1910), who, in *The Four Million* (1906) and other books, wrote of the life of the people, and employed the Amer. idiom with much original power, and became one of the outstanding humorists of his time in the art of the short story. Earlier humorists, apart from 'Mark Twain,' are Charles F. Browne ('Artemus Ward,' 1834-67), Henry W. Shaw ('Josh Billings,' 1818-85), Joel Chandler Harris (1848-1908), the author of the *Uncle Remus* stories, amusing dialect fantasies. The more serious short story of the 'nineties is represented in the work of Ambrose Bierce (1842-1914). In the summary of Amer. literature must be included Sarah Margaret Fuller (Ossoli, 1810-50), and R. H. Dana (1815-82), author of *Two Years Before the Mast* (1840).

The naturalistic novel, however, which had been estab. in the 'nineties through Russian and Fr influence working through such men as Howells, Norris, and Garland who have been mentioned above, survived into the twentieth century and took the popular form of elemental virility in the novels of Jack London (1876-1916), whose *Call of the Wild* appeared in 1903. Naturalism of a type, no less bitter, but more in sympathy with humanity, is found in the works of Theodore Dreiser (1871-1945), a writer who probes with compassion every detail of human life. A satirist of the effect of modern business life upon the Puritan conscience, is Robert Herrick (1868-1938), author of *Waste* (1924). Satire of social life, but in a lighter vein, is also a characteristic of the work of Booth Tarkington, while of modern novelists the satirist *par excellence* is Sinclair Lewis, who has turned his satire successively on life in the small tn. (*Main Street*, 1920) or small city (*Cass Timberlane*, 1945), on the business man (*Babbitt*, 1922), on the doctor (*Arrowsmith*, 1925), and on the clergy and revivalist (*Elmer Gantry*, 1927). Chief among the propagandists is Upton

Sinclair, whose book, *The Jungle*, appeared in 1906 as a result of his investigation of the Chicago stockyards. A voluminous writer, he has two other outstanding books in *Oll!* (1927) and *Boston* (1928), the latter dealing with the trial of Sacco and Vanzetti (q.v.). Allied with him in what may be called 'sociological criticism' are Randolph Bourne (1886-1918), Van Wyck Brooks, Ludwig Lewisohn, and R. M. Lovett. Sherwood Anderson (1876-1941) was more a master of the short story than the novel, and he and Willa Cather share with Dreiser, Edith Wharton, and James Branch Cabell the distinction of being the leading Amer. novelists in the 'twenties. Another romanticist, but one who escapes from life into his colourful background, is Joseph Hergesheimer. Escape from realism is also found in the romances of Donn Byrne (1889-1928), and the more sophisticated type of romance, *The Bridge of San Luis Rey* (1927) by Thornton Wilder. Another novelist of greater psychological penetration is Susan Glaspell, while in contrast is the terse style and vivid realism of Ernest Hemingway. Novelists equally competent are John Dos Passos, Louis Bromfield, Thomas Wolfe (1900-38), and Glenway Westcott. The vogue of fiction after the First World War, produced many writers of varying and distinctive merit. Among them may be mentioned Gertrude Stein (remarkable for new experiments with time in prose), Elizabeth Madox Roberts, Carl Van Vechten, Wilbur Daniel Steele, Irvin Cobb, Ben Hecht, John Galsworthy, Fannie Hurst, William Faulkner, Kathleen Norris, and Charles Norris (author of *Bread*, 1923).

The trend of fiction between the two World Wars was away from individualism and towards social consciousness, two outstanding examples being *The Grapes of Wrath* (1929) by John Steinbeck, and *Tobacco Road* (1932) by Erskine Caldwell. Margaret Mitchell's monumental *Gone with the Wind* (1936), was the finest of a series of epic-novels dealing with the civil war period.

Enduring work has been done in the essay by Henry Brooks Adams (1838-1918), and Woodrow Wilson (1856-1923), and in philosophy by two writers of lasting influence and distinctive style: William James (1842-1910), and George Santayana. In literary criticism the flourishing condition of creative literature has produced many controversies, the main conflict being between the 'humanistic' and the naturalistic attitudes to life. The former was maintained by the 'conservatives'—Paul Elmer More, George Woodberry, J. J. Chapman, H. S. Canby, Irving Babbitt, and Stuart Sherman. On the naturalistic side are John Macy (1877-1932), Van Wyck Brooks, Ernest Boyd, and H. L. Mencken. The latter through *The American Mercury*, of which he was editor, wielded a powerful and salutary influence over Amer. life and letters. His championship of Dreiser and Cabell against unintelligent criticism placed Amer. literature in his debt. Another critic of importance in setting standards

of taste is W. C. Brownell (1851-1928), while personal and impressionistic criticism is exemplified by James G. Huneker (1860-1921), and G. J. Nathan. Historical criticism of another kind, treating of nationalism as an asset in literature, was exemplified in *The Irresponsibles* (1940) by Archibald Macleish and *What is Primary Literature* (1941) by Van Wyck Brooks, author also of *The Ordeal of Mark Twain* (1920), *The Pilgrimage of Henry James* (1925), *The Flowering of New England* (1936), and *New England Summer, 1865-1915* (1940).

*Twentieth-Century Poetry.*—The beginning of the century was marked by a poetic renaissance. The movement had been begun by Whitman, furthered by Hovey and the Canadian Carman, and ushered in by Edwin Markham (1852-1940) (*The Man with the Hoe*, 1899), and William Vaughan Moody (1869-1910). In Oct. 1912 the first number of *Poetry, A Magazine of Verse*, appeared. It was ed. by Harriet Monroe, and was an anthology of the 'new' poetry of the better Amer. poets of the twentieth century. Lee Masters with his *Spoon River Anthology* (1915) scored the most phenomenal success, but his method of brief and acid portraits was anticipated by E. A. Robinson, a poet whose chief theme is the pathos of frustration. Robinson shares his New England austerity with Robert Frost, whose work expresses the spirit of New England. An interpreter of a different aspect of Amer. life is Carl Sandburg, whose *Chicago Poems* appeared in 1916. The characteristic of these poets is their determined use of everyday speech, and a professed 'people's poet' is Vachel Lindsay (1879-1931). He and Sandburg both poets of the Middle W., derived from Whitman. The Imagist movement was launched by Ezra Pound, a cosmopolitan poet who finds much of his inspiration in Provencal and Chinese literature. The first declaration of Imagism in America was *Some Imagist Poets* (1915), ed. by Aray Lovell (1874-1925), who, one of the most successful writers in free verse, identified herself with the movement. Amer. poets who were Imagists were John Gould Fletcher and 'H.D.' (Hilda Doolittle), whose exquisite workmanship has alone remained within the tenets of Imagism. Conrad Aiken, a metaphysical, attached himself for a short time to the movement, while other successful exponents of free verse were Maxwell Bodenheim and Alfred Kreymborg. T. S. Eliot (q.v.), whose *Waste Land* was first pub. in England in 1922 and then appeared in the Amer. magazine, *Dial*, became the leader of poetic experimenters in England and America, and an outstanding figure among modern poets. With T. S. Eliot the influence of Laforgue and the Fr. Symbolists was evident in Amer. literature, an influence equally apparent in younger poets of the period, including Hart Crane (1899-1932), whose poem *The Bridge* appeared in 1930, Malcolm Cowley and Archibald Macleish (q.v.). The two last-named have also won a considerable reputation as critics. Allen Tate is a

poet of the intellectual school, deriving from T. S. Eliot. He, with John Crowe Ransom and Robert Penn Warren, formed a group which became known through their magazine, *The Fugitive* (1922-25). Narrative verse found a powerful exponent in Robinson Jeffers, whose *Tamar* appeared in 1924. Wallace Stevens is another important poet of the period. His first book *Harmonium* of luxurious and eloquent poetry, did not appear until 1923 although he had been a discoverer of the 'new' *Poetry* anthology of 1912. He is an artist of great sensibility who reached maturity with *Ideas of Order* (1935) and *The Man with the Blue Guitar* (1937). Robert Lee Frost's finest poetry is descriptive, and gives vivid pictures of the countryside of New England. Among his poems are *The Lovely Shall be Choosers* (1929) and *A Witness Tree* (1943). The poetic renaissance in America between the wars was indeed remarkable, nor must the contribution of Negro poets be forgotten, headed by P. L. Dunbar (1872-1916), and including James Weldon Johnson (1871-1938) and the gifted Countee Cullen (see also under NEGROES).

ART.—Amer. art, unlike that of the Amer. Indians (see AMERICAN INDIANS, *Arts and Crafts*), dates only from the third quarter of the seventeenth century. The sparsity of the settlements and the lack of communication between them at this period meant that a general tradition was impossible; such work as existed, which was mainly confined to New England, consisted of sev. individual enterprises. As the early artists generally came from the Eng. provs, their style was often slightly behind 'hat existing in the cap. The different nationalities of the immigrants meant, however, that other artistic traditions—Dutch, Ger., Fr.—combined with the Eng. one; this mixture of styles has been a general characteristic of Amer. art.

The increased prosperity of the cities on the E. seaboard, from Boston to Charleston, encouraged artistic activity during the eighteenth century, and an indication of the high standards of living can be seen in colonial silver, which though mainly following the Eng. example, had its own characteristics of simplicity and craftsmanship. The process of adapting European examples to colonial needs was evident in architecture, where the main inspiration, other than Sp. in the S.W., was Eng. Georgian to which such special effects were added as the use of brick. The painters, though sometimes dabbling in religious works and landscapes, were mainly portraitists. The somewhat naive imitation of the aristocratic court portrait found in the early part of the century surrendered at the hands of John Smibert (1688-1751) and Robert Feke (c. 1705-c. 1750) to a more direct manner of assessing character, which reached its climax in the sharp realism of John Singleton Copley (1738-1815).

Although colonial art was mainly a reflection of that existing in Europe and was completely inspired by it, Benjamin

West (1738-1820), who became president of the Royal Academy, exerted some influence in Europe as a champion of romanticism and Neo-Classicism, which became the most favoured style after the War of Independence. A wish to celebrate the growing pains of the Republic was reflected in John Trumbull's (1756-1843) records of such notable events as the battle of Bunker Hill and the Declaration of Independence. Such heroes as Washington found immortality in the fluid, elegant yet shrewd style of Gilbert Stuart (1755-1843) who was the leader of a competent generation of portraitists. The romantic stirrings of the early nineteenth century were equally effective in America, though the struggles of Washington Allston (1779-1843) to finish his *Belshazzar's Feast* indicated the general failure of the romantic approach in subject paintings, and a more genuine, if naive, spirit marked the Sunday Painters—the so-called Primitives—who now began to come into their own. America itself was increasingly described by the landscape artists, notably by Thomas Cole (1801-1848), the school which took its name from the Hudson R., (1811-1876).

An investigation of national elements was not, however, sufficient; the second half of the century witnessed a determined desire to enrich the country's cultural heritage by the importation of old masters from abroad and by a frank study of the masters of modern art. The sensitive approach to nature of the Barbizon School influenced George Inness (1825-1894), the author of a series of gentle atmospheric landscapes. His work announced the appearance of a style, which like that of Copley or West in the past, was genuine and fresh, and which found its principal exponents in Thomas Eakins (1844-1916) and Winslow Homer (1836-1910). This evolution was paralleled in architecture and a specifically Amer. style of building—the skyscraper—sprang up in Chicago of the 1880's. The attempt to come to grips with American life was not the only current in nineteenth-century art; it was accompanied by the attempt to escape from the realism and monotony of a materialistic society, which suggested the Gothic revival, the Amer. counterparts of the Pre-Raphaelites, the symbolist work of Albert Pinkham Ryder (1847-1905) and the eclectic culture of Boston. It was a period in which expatriation was the order of the day, and Whistler's 'Japonaiseries', silhouette portraits and nocturnes played an important part in European painting; while John Singer Sargent (1855-1925) devoted the methods of big business to his portraiture of cosmopolitan society. The response to French nineteenth-century art was considerable as can be seen in Mary Cassatt (1855-1925) who added something of her own to Degas' style. The Impressionism of Monet inspired such charming members of the group, known as 'The Ten', as Childe Hassam (1859-1935) and Theodore Robinson (1850-96). Their sensitive application of paint did not satisfy the robust realists of the

1900's: led by Robert Henri (1865-1929), and their sobriquet of 'The Ashcan School' indicated the nature of their art.

Since the 1900's many factors have encouraged the artist—the activity of such dealers as Alfred Stieglitz, the patronage of the New Deal, the foundation of the Whitney Museum and the Museum of Modern Art. All the major tendencies of the contemporary scene—Realism, Expressionism, Abstraction—have their advocates, and the sculpture of Alexander Calder (b. 1898) and architecture of Frank Lloyd Wright (b. 1869) indicate that Amer. art now enjoys an international importance.

**Music.**—The hist. of Amer. composed music (as distinct from the multiplicity of forms of folk music) can only be said to date from the eighteenth century. The first native composer is often considered to be William Billings (1746-1800), whose settings of psalms contain fierce and unsuited music. He also wrote patriotic songs for the War of Independence; he d. a pauper in Boston. Billings's reputation as the first Amer. composer is challenged by John Antes (b. 1740 in Pennsylvania), the Ger.-born Conrad Bessel (said to have contributed 1000 hymns to Franklin's *Ephrata* collection, 1730), and William Tuckey (1708-1781). Another claimant is Francis Hopkinson (1737-1791), the first secretary of the navy, poet, essayist, inventor, and painter. His cantata, *The Temple of Minerva* (1781), may be called the first Amer. opera. James Hewitt's *Tammany* (1794), contains the first music said to be based on Amerindian (Cherokee) melodies. Thus it is seen that the U.S. was producing a small amount of music for itself even before the musically-important year of 1825, when the Garcia company introduced It. Grand Opera to New York. The 1840's and '50's were most noted for the popularity of the minstrel show. Outstanding in this field is the composer Stephen Foster (q.v.), one of the founders of the present-day U.S. supremacy in the popular-song industry. The renown of popular song writers, such as Cole Porter, Jerome Kern, and Irving Berlin, contrasts with the undistinguished series of Amer. operas performed at the Metropolitan Opera House, New York. These began in 1910 with Converse's *Pipe of Desire*, and the more successful include Deems Taylor's *Peter Ibbetson* (1931), and Parker's *Mona* (1912). As far as symphonic music is concerned, no more than a handful of U.S. composers have become known. Success within the U.S. has been dependent on the number of first-class orchestras; thus, the founding of the New York Philharmonic (1842), the Boston Symphony (1881), the Chicago Symphony (1891), and other orchestras, coincided with the first symphonic composers, many of whom are now almost forgotten. The *Edipus Tyrannus* of John Knowles Paine (1839-1906) was performed seventeen years after his death; but his best achievement was really the success of his composer pupils, Daniel Gregory

Mason, Frederick S. Converse, Arthur Foote, and John Alden Carpenter. Others of his pupils formed the so-called New England School, in which were found many of the foremost twentieth-century composers, e.g. George W. Chadwick and Horatio Parker. Perhaps the foremost of all was Edward MacDowell (1861-1908); he has become a criterion for good modern Amer. music—though not for the so-called Modernists, who form no integrated group, being each intensely individual. There are a great number, the most notable being perhaps Aaron Copland, Roy Harris, and Wallingford Riegger.

**Folk Music and its Modern Derivatives.**—The true Amer. folk music is obviously the music of the Amerindian races. Important research has been done by such men and women as Theodore Baker, Alice Cunningham Fletcher, Frederick Burton, and Frances Desnoes, who have noticed similarities to Russian and Chinese folk music. Amerindian music, however, is very primitive and a thing apart, having had very little influence on composer, or on the other types of folk music. These other types have sprung from the same source as the pop. of the U.S., and are just as varied. Minority groups of folk music exist, as the Scandinavian in the N.W., the Ger. in Pennsylvania, the Sp. in California and the Mexican border, and so on; but the two great origins of U.S. folk music and its derivatives are the heritages of the Brit. emigrants and of the Negro slaves. First, the old songs and ballads of England, Scotland, and Ireland were brought with the settlers to the Atlantic coast, whence they spread slowly inland. In the Appalachian mts. they found ideal conditions for preservation, so that in many cases old songs still flourish there. The Brit. songs also formed the basis for a tremendous variety of pioneer songs. Similarly, the greater part of the Amer. country dances are of Brit. origin (e.g. the Virginia Reel is almost identical with Sir Roger de Coverley). The second major root is that of the African Negro music, together with the Creole. The religious songs (spirituals) of the Negro (see NEGRO SPIRITUALS), took the fancy of the white populations during the nineteenth century, resulting in the pseudo-spirituals, minstrel, and 'coon' songs, which mingling with the white tradition, produced in turn the staccato, boisterous style of piano music known as 'ragtime' (q.v.). This reached its peak about 1910, when it combined with the 'blues' (Negro songs of lamentation) to form jazz (q.v.). After the First World War, three styles of music developed: the original blues evolved into such abstruse forms as 'boogie-woogie.' Meanwhile, the compound jazz divided into two styles: 'sweet' jazz (highly orchestrated, which died out before 1930) and 'hot' (improvised) jazz, which became wilder and eventually impossible to transcribe. The term 'swing,' which became current about 1935, denoted the phase into which much sweet jazz had passed. The 1940's saw

the rise of 'bop' or 'he-bop' but in 1950 its real significance could not be judged. Other modifications of the jazz style were and are being made by both Negro and white performers and orchestrators.

FILM.—In 1885 Wm. Friese-Green (q.v.) invented a camera capable of taking motion pictures, and from that moment commercial cinematography was possible. Round about the turn of the century many experimenters were making and showing short films; but the commercial film as a money-maker may be said to have been born in the U.S.A. in 1903, when *The Great Train Robbery* appeared, having what was then the considerable length of 800 ft. This film was shown all over the U.S.A. for many years. Wherever a new nickelodeon, as the film houses were called, was opened, *The Great Train Robbery* was the first film to be shown there. From 1903 onwards those men began to enter the film industry in the U.S.A. whose names now indicate the big film-manufacturing companies—Warner, Fox, Laemmle, Goldwyn, Zukor, and Lasky. The films made by these early pioneers were slapstick and comedies and 'westerns'. The form of the 'western' has proved durable. The modern versions have a slickness and sophistication, but the shape remains. After the early 'western' serial thrillers were in fashion. In 1914 David Wark Griffith, with some financial help but entirely on his own responsibility and in the teeth of the opposition of all the existing film corporations, supervised and directed a film, appearing in the following year, which was to change all over the world ideas about film-making. This was *The Birth of a Nation*. In 1916 Griffith made a second and equally important film, *Intolerance*. He thereby established the film as something more than vaudeville entertainment. What had commenced as one of the attractions of itinerant showmen became, through Griffith, a new art form existing in its own right and competing with the stage for the attention of the public; of equal importance was Charlie Chaplin, whose custard-pie films were true cinema. (See further under CINEMATOGRAPE, *Development of the Film and Film Acting*).

With the introduction of sound, films became infantile again. From a chaos of vulgar noise the sound film was rescued by a series of great directors who from then to the present day have worked to restore to the Amer. film its essentially cinematic qualities—outstanding are Robert Flaherty (*Man of Aran, Louisiana Story*), Frank Capra (*It Happened One Night, Mr Deeds Goes to Town*), William Dieterle (*The Story of Louis Pasteur, All That Money Can Buy*), John Ford (*The Informer, Stage Coach, Grapes of Wrath*), Ernst Lubitsch (*The Merry Widow, Ninotchka*), Preston Sturges (*Palm Beach Story, Sullivan's Travels, Hail the Conquering Hero*), The Marx Brothers (*Night at the Opera, At the Circus*), and Walt Disney, whose enormous versatility has developed the film cartoon into such varied and popular entertain-

ment as *Snow White and the Seven Dwarfs, Fantasia, and Bambi*.

An astonishing technical competence marks the Amer. film to-day, the result of a div. of labour in which each separate technical process is in the hands of an expert dept. What too often disappears as a result of this way of making films is quality: for quality in films is an imponderable resulting from a fusion of script, art direction, camerawork, sound. This happy fusion will take place when the mind of a film director contains and controls the whole effort and also when the team is small enough to work together as a team. Quality arrived at in this way is to-day more often found in Brit. and Continental films where units are smaller and the film director retains much more co-ordinating authority than is possible in a vast Amer. film factory.

DRAMA.—See DRAMA, *American Drama*.

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**United States of Brazil**, see BRAZIL.

**United States Steel Corporation** was incorporated in the State of New Jersey in 1901. Its purpose was to combine a number of companies in order to achieve the benefits of a fully integrated steel operation from raw materials through a wide variety of finished products. U.S. Steel's facilities have been augmented from time to time in order to round out its operations and better to serve the

changing demands for steel as America's economy continues to expand.

U.S. Steel's proportion of the total Amer. steel production declined more or less steadily from 66 per cent in 1901 to about 33 per cent in the early 1930's, and has since then remained virtually unchanged.

**Units**, standards, arbitrarily chosen, in terms of which quantities may be expressed. Scientifically, Us. are of two kinds, viz. fundamental and derived. The fundamental Us. are those in terms of which all others can be expressed. See further under PHYSICAL UNITS.

**Unity of the Brethren, The**, see MORAVIANS.

**Universal**, abstract conception formed by stripping a concrete percept of all accidentals, thus creating a concept which embodies the features common to all. Thus *man* in the abstract is a universal term, while an individual man is the particular. For the great medieval controversy as to the real existence of Us., see NOMINALISM.

**Universal Declaration of Human Rights**, see HUMAN RIGHTS.

**Universalists**, primarily those who hold the opinion first definitely upheld by Origen, that all men and even the devils themselves will finally be saved. This opinion, or a modified form of it which said that all men would be saved, was common in the early centuries and is not uncommon to-day. The name U. is also given to a sect founded in 1774 in America by John Murray. The Amer. Universalist Church had 44,600 members in 1950.

**Universal Language**, see ESPERANTO; VOLAPUK.

**Universe, The**, see COSMOGONY, COSMOLOGY, NEBULAR HYPOTHESES, SPACE AND TIME.

**Universities**, corporations, either lay or clerical, which have had the charge of educating the members of the learned professions throughout Europe and the colonies founded by European states. The univ. of Pavia, Italy, was traditionally founded by Charlemagne, in 774. The beginnings of Oxford Univ. cannot be traced back further than the early twelfth century, although legend has ascribed the foundation to Alfred in 872. But univ. life more nearly as it is understood to-day begins with the foundation of the univ. of Paris, which became consolidated towards the end of the twelfth century. To almost every cathedral and monastery of Europe there has, from a very early period, been attached a school in which were instructed all candidates for the priesthood and such laymen as could afford it. About the time of Abelard (d. 1142), many scholars began to gather in Paris, and the reputation of Abelard himself did much to make Paris Univ. famous. A more elaborate organisation became necessary, but the Parisian organisation is marked by being primarily in the hands of the teachers and doctors. Paris was the most famous example of the univ. in which the gov. rested almost entirely with the teachers. Opposed to Paris in this respect was Bologna: here all jurisdiction rested with

the students, who elected their own governors. Oxford differed from Paris by becoming independent of episcopal jurisdiction early in its history. During the Middle Ages Paris was a great theological school; Oxford was famed for its theology and philosophy. Bologna was pre-eminent in the study of canon law, and Salerno was famous for its medical school. The growth of U. throughout Europe was rapid. With the revival of learning, and the Reformation, the old U. underwent some change and many new ones were founded. They lost almost entirely their clerical character, other sciences were added, and the power of the U. was gradually restricted. The spread of learning prevented its monopoly by close corporations, and the invention of printing co-operating with the extension of elementary and secondary schools did much to raise the standard of education among those classes which did not receive a univ. education. In no way less considerable is the change which has passed over the U. of Europe during the past century. The general expansion of men's minds, due to the inventions of the time and the spread of civilisation, has made this necessary, while the most important single factor is the rapid advance made in the study of natural science.

There is some danger that the older academic purpose of univ. education may be lost in the democratic tendency to turn the univ. into a place for training men and women for any and every walk of life. Univ. extension courses were devised largely to find a mean between these two extremes; Cambridge Univ. started local lectures in 1873. Eng. U., although some vocational courses are occasionally included in their curriculum, has therefore avoided the difficulties of many Amer. U. (Columbia and Chicago among them), which admit as degree subjects, 'practical poultry-raising,' 'advertising,' 'feature-writing,' 'book reviewing,' 'wrestling, judo, and self-defence.' This *ad hoc* training is not common to all; among those which reject it are Harvard, Yale, Princeton, and Swarthmore. Post-graduate work, both in England and the U.S.A., is a feature of modern U. The graduate school at Yale was estab. in 1847 and of Harvard in 1872, but their distinctive developments were later, following the creation of a graduate school at Baltimore in 1876, on the Germ. model, and the opening of the Johns Hopkins Univ. in the same year. Ger. univ. education was formerly aristocratic in tone, but, though after the Fr. Revolution equality of opportunity was introduced, standards were not lowered. Univ. education is now extended to women in European and American countries and, since 1920, in Japan, women being either admitted to the older U. or forming U. of their own. Women were admitted to degrees in London Univ. in 1878. Girton College (*q.v.*) was founded at Hitchin in 1869. Women were admitted in Cambridge to the Tripos in 1872, to degrees in 1923, to univ. teaching posts in 1926, and in 1948 to

full membership of the body academic. In Oxford women were admitted to examinations in 1884, to degrees and full membership in 1920, and to univ. teaching posts in 1927. Women were admitted to U. of Scotland in 1892, Durham 1896, Dublin 1904. All later Eng. U. are co-educational. Co-education is almost universal in Amer. and Canadian U., with certain notable exceptions.

*Universities in the British Empire.*—In 1949 there were over 70 U. in the Brit. Empire, and there is much cause for satisfaction in the way Brit. academic tradition has been maintained in the Dominions. Australian U. are an example of the dominion type. They form a relatively homogeneous group owing to their general similarity of origin and constitution; all were estab. by Acts of the State Legislatures, but are not 'state universities' in the Amer. sense, but, like most of the British U., are, by statute and royal charter, self-governing academic corporations, though, underlying this general uniformity of type there are no doubt individual differences and variations. An Act passed in 1946 by the Parliament of the Commonwealth provided for a new Australian National U. at Canberra, which would probably differ markedly from the other U. in some features, notably in the predominance of post-graduate studies. The other U. are those of Sydney, Melbourne, Adelaide, Hobart, Perth, and Brisbane.

An impetus to increased univ. facilities in the colonies was given by the Asquith Commission on Higher Education in the Colonies (Cmd. 6647, 1945), and the Elliot Commission for Higher Education in W. Africa (Cmd. 6655, 1945). On the recommendations of the Carr-Saunders Commission (1948) it was hoped to estab. a univ. in Malaya by amalgamating the College of Medicine, founded in 1905, and Raffles College founded in 1928. Makerere College, Kampala, Uganda, is an E. African institute for Higher Education, moving towards univ. status. For further details of U. in the dominions and colonies, see under the respective countries.

*British university expansion, 1939-48.*—There was a rapid expansion of student numbers in the Brit. U. after the Second World War, but the scholastic standards suffered little, if any, deterioration especially at the classic three U., Oxford, Cambridge, and London. The number of students (1939-48), rose from 50,002 to 78,507, all the increase being actually from 1945. Some expansion was due to accumulation of the war years rendered effective by the policies of further education and training grants, but the main pressure on the U. to increase their student rolls came from the gov. through the report of the Barlow Committee on Scientific Manpower (issued May, 1946), which recommended it as in the national interest to double the output of graduates in science and technology, while recommending concurrently an increase in the numbers taking the humanities. The *Returns from Universities and University Colleges for the Academic year*



1947-48 showed that the eight civic U. in 1948 had 2391 teachers for their 21,702 students, while the classic three had 2542 teachers for 31,415 students. As a whole, in all Brit. U. the full-time teaching staffs had risen from 4000 in 1939 to 6500 in 1948.

According to the Report of the University Grants Committee (Nov. 1948), the total income of the U. in Great Britain more than doubled in the period 1935-47, while capital grants from the State, extremely small before the Second World War, amounted to £50,000,000 for the period 1947 to 1952. The number of students rose from 50,000 to nearly 83,000 in the above 12-year period and in science and technology the doubling recommended in 1946 by the Barlow Committee on scientific man-power was almost achieved by 1947. See *University Development from 1935 to 1947*, H.M.S.O., 1948. See J. H. Newman, *Idea of a University*, 1873; H. A. L. Fisher, *The Place of the University in National Life*, 1919; Sir C. Mallet, *A History of the University of Oxford* (3 vols.), 1924-27; E. Deller, *Universities in the United States*, 1927; H. G. G. Herklotz, *The New Universities*, 1928; A. Flexner, *Universities: American, English and German*, 1930; C. Norwood, *The English Tradition of Education*, 1930; H. Rusdall, *The Universities of Europe in the Middle Ages*, 1936; L. Lowell, *What a University President has learned*, 1938; E. Bradby, *The University Outside Europe*, 1939; C. S. Marsh, *American Universities*, 1940; B. Truscott, *Redbrick University*, 1913; F. R. Leavis, *Education and the Universities*, 1943; J. Ortega y Gasset, *Mission of the University*, 1944; Sir C. G. Robertson, *The British Universities*, 1944; and Sir E. Barker, *British Universities*, 1945.

**University College**, see LONDON.

**University College Hospital**, originally the N. London Hospital, Gower Street, was founded in 1833 out of public funds acquired by the Gower Street College (later Univ. College). In 1898 the Medical School became independent of London Univ. and was later housed in new buildings. The hospital was further enlarged in 1928. U. C. H. was designated a teaching centre under the National Health Service Act, 1946.

**University College of North Staffordshire**, see NORTH STAFFORDSHIRE.

**University College, Oxford**, dates from the year 1219, when William, Archdeacon of Durham, bequeathed a sum of money to maintain certain graduates of the univ., the institution obtaining the name 'The Great Hall of the University,' which is still part of its designation. Whether Wm. of Durham intended by his bequest to initiate a major change in the character of Oxford life is unknown; but it seems certain that in the generation following his death (1249), the collegiate system was instrumental in shaping it. In the beginning his foundation was probably confined to clerks from Durham. The title of the society of U.C. was 'Scholares Willelmi de Dunelmia,' which title appears on the original college seal and was only

altered in 1573 when it became 'the masters and Fellows of the College of the Great Hall of the University of Oxford.'

**University College School**, Eng. public school at Hampstead. Founded in 1830 as 'The London University School,' the name was modified some years later. The school was transferred to Hampstead in 1907. There are some 550 boys, and in addition a preparatory dept. is maintained.

**University Settlements**, see under SOCIAL SETTLEMENTS.

**Unreason, Abbot of**, see ABBOT OF UNREASON, and FOOLS, FEAST OF.

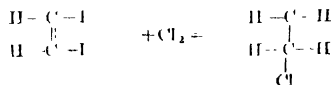
**Unruh, Fritz von** (b. 1888), Ger. author, b. in Koblenz, of a family of anct. Ger. nobility, with a high military tradition.

U. became a Guard officer. In 1910 he wrote a drama *Offiziere* (pub. 1911), opposed not only to the ideas of family tradition, but also to the sentiments and traditions of Ger. officers, militarists, and nationalists. He resigned his commission in 1912.

After the First World War U. was among the founders of the Ger. Republican Party. After 1911 U. lived in the U.S.A. His later works include *Miss Rollschuh* (a comedy), and the novels, *Who Never Lost*, and *The End is not yet*. See studies by F. Engel, 1922, and A. Kronacher, 1946.

**Unsaturated Compounds**, in chem., compounds that will form derivative substances by direct addition. Thus ethylene,  $C_2H_4$ , combines directly with chlorine to form ethylene dichloride,  $C_2H_4Cl_2$ ;  $C_2H_4Cl_2$  and acetylene,  $C_2H_2$ , will combine directly with bromine to form acetylene tetrabromide,  $C_2H_2Br_4$ ;  $C_2H_2 + 2Br_2 = C_2H_2Br_4$ . Ethylene and acetylene are therefore said to be unsaturated, as contrasted, for instance, with methane,  $CH_4$ , which can form derivatives only by substitution. Thus, when methane reacts with chlorine, a hydrogen atom is removed for every chlorine atom that enters:  $CH_4 + Cl_2 = CH_3Cl + HCl$ ;  $CH_3Cl + Cl_2 = CH_2Cl_2 + HCl$ ; and so on. Unsaturation can usually be explained by assuming unsatisfied valency bonds in the compound. Thus, in ethylene,  $H_2C=CH_2$ , the two carbon atoms are held together by a double bond, while a single one would be sufficient and would indeed be stronger, since the partial satisfaction of the bonds is easily disrupted when an opportunity for full satisfaction occurs.

Cl



Unsaturated.

Saturated.

**Unsoundness**, see WARRANTY.

**Unst**, is. of the Shetland Isles, most northerly of the Brit. Isles, 40 m. N.E. of Lerwick. There are two anchorages, and fishing and knitting are carried on. U. also has chromite of iron and tale mining industries.

**Unterwalden**, forest canton of Switzerland, lying to the S. of the Lake of Lucerne. It is divided into Obwalden (area 189 sq. m.) and Nidwalden (area 106 sq. m.). Pasturage and dairy work are the chief industries. It was one of the founders of the Confederacy; the Rom. Catholic pop. is Ger.-speaking. Sarnen and Stanz are the caps. Total pop. 37,700.

**Untouchables**, or **Depressed Classes**, also called scheduled castes or outcastes, Hindus of the lowest social status who do not belong to the caste of priests, soldiers, traders, or artisans. They are untouchable to the caste Hindus, who consider themselves polluted by their touch. The test barriers between the castes are food and marriage, but owing to the shortages of food and the growth of W. influence the caste system is becoming less strong. See B. R. Ambedkar, *The Untouchables* (New Delhi), 1949.

**Unwin, Sir Raymond** (1863-1940), Brit. architect. He was educated at Magdalen College School, Oxford. He was an authority of international repute on housing and tn. planning, and he held a number of public appointments. He was responsible for the lay-out of Rowntree village, near York, and also for the Letchworth Garden City, and the Hampstead Garden Suburb.

**Unwin, Sir Stanley** (b. 1884), Brit. publisher and sole owner and governing director of George Allen & Unwin, Ltd., publishers. He was educated at Abbotsholme and in Germany, and after early experience in German bookselling and in printing, joined the publishing firm of T. Fisher Unwin in 1903, of which he later became manager. Leaving the firm in 1912, he travelled round the world, visiting booksellers, librarians, and editors, and on Aug. 4, 1914, founded the firm of George Allen & Unwin to take over the assets of George Allen and of Swan Sonnenschein. Having progressive leanings from the first, the firm attracted many authors whose names became famous in the world of ideas, among them Bertrand Russell, J. A. Hobson, Ramsay MacDonald, Lewis Dickinson, Gilbert Murray, Harold Laski, R. H. Tawney, L. T. Hobhouse, Graham Wallas, etc. U. is President of the International Publishers Congress and Past President of the Publishers' Association of Great Britain and Ireland, is on the governing body of the British Council, and is chairman of John Lane the Bodley Head, Ltd. He received the Hon. D.L.D. of Aberdeen University in 1915 and was knighted in 1946. His book, *The Truth about Publishing* (1926, 6th ed. 1949), is the standard work on the subject. Other works include *Publishing in Peace and War* (1914).

**Unyoro or Bunyoro**, formerly a kingdom of Brit. E. Africa. It is now part of the Brit. Protectorate of Uganda. Its area is about 5600 sq. m. and the native pop. about 100,000. Masindi is the chief tn.

**Upanishad**, see VEDANTA.

**Upas-tree**, see ANTARIS.

**Uphall**, par. and vil. of W. Lothian, Scotland, on Brox Burn. There are paraffin works and oil-shale is mined. Pop. 11,100.

**Upholland**, urban dist. of Lancashire, England, 4 m. from Wigan. Brick-making and agric. are the chief industries. Pop. 6200.

**Upolu**, see SAMOA.

**Upper Austria**, see AUSTRIA, UPPER.

**Upper Canada**, see ONTARIO.

**Upper Franconia**, N.E. region of Bavaria, Germany. It is bounded by a plateau in the W. and the Jura mts. rise in the E. Granite and kaolin are found. There is an industrial region centred round Bayreuth, the cap. The chief industries are glass, wood, porcelain. Pop. 757,500.

**Uppingham**, mrkt. tn. in Rutlandshire, England, with a fine church. The public school, founded in 1584, reached its present position as one of the leading Eng. schools under Dr. Edward Thring, headmaster from 1853 to 1887. Pop. with rural dist. 6700.

**Uppsala**, or **Upsala**. 1. Län of Sweden, in the E. central part. Iron ore and granite are produced, and there is much forest. Area 2056 sq. m. Pop. 149,800. 2. Cap. of the above, on both sides of the R. Fyris. The old tn. is on the W. bank and the new on the E., the two being joined by five bridges. It is a tn. of



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UPPSALA: THE OLD CHURCH  
(12th Century)

great historical interest. Its univ., with which Linnæus was connected, was founded in 1177 and the new buildings were erected in 1879-86. It has a famous library, containing some 700,000 books, and 17,000 MSS. In the Gothic cathedral (1230-1435) are buried Gustavus Adolphus and Linnæus. The cathedral is the greatest surviving achievement of Swedish Gothic architecture: its S. door is especially notable. U. is the metropolitan see of the Swedish State Church. Near U. there is an academy of agriculture. Pop. 60,400.

**Upright**, Book of the, see JASHER.

Ur, the biblical 'Ur of the Chaldees' (bp. of Abraham, *q.v.*), was in the Sumerian period a prosperous metropolis and the cap. of a vast and mighty empire. It was a city-state and a 'city of royalty,' i.e. one of the 'eleven cities of royalties,' which held supreme power in turn. It then stood on the lower Euphrates (before the riv. changed its course), probably near the coastline of the 3rd millennium B.C. Nearly 100 years ago J. E. Taylor visited U. (then only a ruined site known by the Arabs as Tell al-Muqayyar, 'The Mound of Bitumen'), and during his small excavation he found the now famous cuneiform cylinders of Nabonidus of Babylon (556-539 B.C.). In 1918, Dr. Hall cleared part of one end of the tell, but the complete excavation was started in 1922-23 by the Joint Expedition of the Brit. Museum and the Museum of the Univ. of Pennsylvania, under the direction of C. L. (now Sir Leonard) Woolley. A pit was dug down to virgin soil below present soil level; at the bottom, a stiff greenish clay still bearing the marks of plant roots indicated the original marsh. Above this was a black soil with remains of pottery, tools, and weapons of Obelid culture (late fifth millennium B.C.), the earliest culture of Babylonia. Sometime in the middle of the Obelid Period, a flood of considerable magnitude must have swept over at least a part of U. (some scholars consider this flood as an important witness of the Flood in Genesis): this is shown by a layer eight ft. deep of perfectly clean clay above the lowest stratum corresponding to the earliest levels of el-Obelid. The end of the prehistoric period and the beginning of hist. proper is marked by the famous 'royal' cemetery, excavated by Woolley between 1926 and 1931. According to the excavator, these tombs antedate the First Dynasty of U. by 4-5 centuries, and may go back to 3500-3200 B.C., but other scholars connect these cemeteries with the First Dynasty, and the most probable date seems to be c. 2500 B.C. According to some scholars, these tombs are not royal, but belong to priests and priestesses sacrificed in fertility rites. However, all scholars agree that Woolley's finds supply us with a remarkably rich and complete picture of contemporary civilisation. The achievement of the goldsmiths of U. approached perfection. The largest number of graves were those of common folk who were buried in rectangular pits, but the most remarkable tombs, the 'royal,' were built of brick and stone (which must have been brought from at least 30 in. away). During the period of Sumerian revival (after the fall of Sargon's and Naram-Sin's great Semitic empire, and after the final downfall of the Gutians), the Third Dynasty of U. arose in splendour (c. 2070-1960 B.C.). Its first king was Ur-Nammu, 'King of Sumer and Akad.' He built a great ziggurat, which is, nowadays, the best preserved of all monuments of this type. The Assyro-Babylonian word *ziggurat* means *temple* or *top of a mountain*; *ziggurat* is a kind of artificial mountain

or tower, built as high place for a god, whose shrine stood on its summit. The ziggurat of U. is a masterpiece; it was a solid mass of brickwork, 200 ft. long, 150 ft. wide and c. 70 ft. high. Originally, the shrine of Nannar, the moon-god, stood on the top, while the other buildings around the ziggurat (including the temple Gig-par-ku, dedicated to Nin-gal, the moon-goddess and wife of Nannar) belong to a later period. The last king of the Third Dynasty Ibi-Sin was taken captive by the Elamites who invaded the country and sacked the cap. city of U., bringing to an end this powerful royal centre. See Sir C. L. Woolley, *Ur of the Chaldees*, 1930.

**Uremia**, toxic condition caused by insufficient excretion of urea. It may be brought about by kidney disease, or may be mainly nervous in origin, metabolism being disturbed through lack of the necessary stimuli to excretion. The presence of urea in the system brings about toxic effects; the nerve centres are poisoned and there is often a comatose or unco-ordinated condition which often resembles drunkenness. Three varieties are recognised: acute, latent, and chronic.

**Ural**, or **Yaik**, riv. of Russia rising in the U. Mts. It flows S. to Orsk; then N. to Orenburg and Uralsk, and again S. to the Caspian Sea, which it enters at Chapayev by many branches, forming a large delta. For many m. it is the boundary between Europe and Asia. Length 1335 m.

**Ural-Altaic Linguistic Family**. Languages belonging to this family are spoken over vast stretches of Asia and Europe; c. 60,000,000 speakers. They fall into various sub-families or branches: (1) *Finno-Ugrian* comprising Finnish (c. 4,000,000), Estonian (c. 1,000,000), Lapp (c. 30,000), Zyryan or Syryan or Komi (c. 250,000), Votjak (c. 275,000), Mordva (c. 1,000,000), Cheremiss, etc., as well as Hungarian or Magyar (c. 13,000,000), Szekler (c. 150,000), Samoyedic, Vogul, and Ostyak. Many scholars reject the unity of the U.-A. family, and prefer to consider the Finno-Ugrian languages as an independent group. (2) *Turco-Tatar* comprising modern Turkish (c. 18,000,000), some extinct anct. languages of Central Asia, such as the Early Turki of the Kók Turki inscriptions (see under ALPHABET), Uighur, a great number of Turki and Tatar languages and dialects nowadays spoken in various Soviet republics and Central Asia (Kazan Tatar, Azerbaijani, Jagatai, Kashgar, Crimean Tatar, Uzbek, Kumuk, Kirghiz, Bashkir, Turekman, Karait, Chuvash, Yakut, etc.), extinct Tatar languages, and dialects of Central and N. China, etc. (3) *Mongolian branch* including Mongolian proper or Khalkha (c. 2,000,000), Kalmyk (c. 200,000), and Buryat (c. 300,000). (4) The *Tunguz or Tungus* branch including Manchu (c. 500,000). According to some scholars, Jap. (c. 80,000,000), and Korean (c. 30,000,000), and according to others, also the Dravidian languages (see under LINGUISTIC FAMILIES), would belong to the U.-A. family. The main characteristics of the U.-A. L. F. are agglutination

(see under LANGUAGE, CLASSIFICATION OF), and a certain 'vowel harmony.'

**Uralite.** (1) Pyroxene (augite) (*q.v.*) which has been altered to an amphibole (hornblende) (*q.v.*). (2) Name given to a fireproof building material composed of chalk, silicate, and bicarbonate of soda and asbestos fibre.

**Ural Mountains** (the **Hyperborean Mountains**, or **Rhipæi Montes** of the ancients) form part of the boundary between Europe and Asia, and separate European Russia on the W. from Siberia on the E. The chain extends S. from the Kara Sea, an arm of the Arctic Ocean, to the course of the Ural R. The mt. system proper consists of a number of parallel ridges, divided by depressions and valleys, much denuded and eroded by the action of the weather, rivs., sea, and ice. Owing to the severe winters and poor stony soil, the forest gives way to vegetation of the Tundra type at a height of about 2500 ft. The U. M. form the divide between those rivs. which drain towards the Pechora and the Volga and those which drain into the Ob. Horses, cattle, and sheep are reared; rye, oats, and wheat grow on the S. steppes, dairy-farms and mkt. gardens have been estab. near the large tns. The mineral riches of the chain are chiefly contained in the Middle Ural, commonly called *Roubtnoi* (metaliferous), and this section also contains the highest peaks, such as the Kanjakovski Kawen (5000 ft.). The chief minerals produced are gold, copper, platinum, iron, tungsten, nickel, chrome, wolfram, manganese, zinc, lead, and silver. Coal, oil, asbestos, and potassium salts are also found.

**Uralsk**, tn. of the Kazakh S.S.R., 160 m. W.S.W. of Chkalov on the Ural R. There is trade in cattle and grain from the Kirghiz steppe, iron, wool, and leather goods are produced, and the tn. is the terminus of a railway from Ryazan. Pop. 66,200.

**Uraninite**, see PITCHBLEND.

**Uranium**, a metallic chemical element, symbol U, atomic weight 238.1, atomic number 92, which occurs as oxide,  $\text{UO}_2\text{UO}_3$ , in pitch blende, and is found as such in Cornwall, Colorado, the Belgian Congo, and Joachimsthal. The metal is prepared by sev. methods, but may be obtained by the reduction of the chloride with sodium. It is a hard white metal (sp. gr. 18.7), which melts in the electric furnace. U. forms the oxides  $\text{UO}_2$ ,  $\text{UO}_3$ , and  $\text{UO}_4$ , and also oxides  $\text{U}_2\text{O}_3$  and  $\text{U}_3\text{O}_8$ , which may be regarded as combinations of two oxides. U. dioxide ( $\text{UO}_2$ ) and trioxide ( $\text{UO}_3$ ) are both basic oxides, the former yielding the unstable uranous salts (e.g. uranous sulphate  $\text{U}(\text{SO}_4)_3$ ), and the latter the uranyl salts (e.g. the nitrate  $\text{UO}_2(\text{NO}_3)_2$ ). U. peroxide  $\text{UO}_4$  gives rise to the peruranates. U. is radioactive, spontaneously disintegrating into radium, etc., and finally into lead. The period of transformation of U. into lead is extremely great, as may be judged from the fact that, in U. minerals, there is only 1 gm. of radium to every 3 tons or so of U. The isotope 235 of U. is employed

in modern work on atomic fission. See ATOMIC BOMB, RADIOACTIVITY.

**Uranus**, in anoth. Gk. mythology, the husband of Gea (Earth) and the father of Cronos (Saturn) and other Titans, Cyclopes, and Hecatoncheires. He represents heaven and the generative power of the sky with its sun and rain. He was dethroned and mutilated by Cronos, and from his blood were formed the Gigantes on earth and Aphrodite in the sea.

**Uranus**, the first planet to be discovered since the invention of the telescope, was found by Sir William Herschel on March 13, 1781, and named by him *Georgium Sidus* in honour of King George III. Its distance from the sun is about twenty times that of the earth. Its diameter is 39 times that of the earth, and its mass 14.6 times the earth's mass or only one-eighteenth that of Jupiter. In density it is about the same as the latter planet, i.e. one-third more dense than water. Up till 1949 only four satellites (Ariel, Umbriel, Titania, and Oberon) were known, but a fifth was discovered during that year by Kuiper, at the McDonald Observatory, U.S.A.

**Uradhas**, see ARARAT.

**Urari**, see CUKAIRE

**Urban**, name of eight popes.

**Urban I**, *Saint*, was pope 222-30, and maintained a constant struggle against the anti-pope Hippolytus.

**Urban II**, (1012-1099), *Odo of Lagery*, b. at Châtillon-sur-Marne, and originally a monk of Cluny. Soon after his election in 1088, he resumed possession of Rome, the fortresses of which had been occupied by the anti-pope. A council was held at Piacenza in 1095, in which the anti-pope and his adherents were excommunicated. In his later pontificate U. succeeded in driving Henry IV out of Italy. He held a council at Bari in 1098, in which many Gk. bishops were present, and in which the addition of the word *filioque* to the Creed was discussed. Thence he returned to Rome, of which he obtained full and undisturbed possession. U. organised the First Crusade.

**Urban III**, (d. 1187), *Uberto Crivelli*, b. at Milan, became archbishop of Milan 1182, cardinal 1185, and succeeded Lucius III. in 1185. The dispute with the Emperor Frederick Barbarossa came to a head, the latter stopping communication between Ger. bishops and the pope, and sending his son to devastate the papal estates.

**Urban IV**, (c. 1200-64), *Jacques Pantaléon*, b. at Troyes. Elected in 1261, he spent most of his time away from Rome. He extended to the church the feast of Corpus Christi in 1264.

**Urban V**, (1310-70), *Guillaume Grimoard*, b. in Languedoc, became a Benedictine. In 1361 he went as papal legate to Italy, and became pope in 1362. He is remarkable as the last of the popes who resided at Avignon, and the one by whom the papal seat was for a time re-transferred to Rome.

**Urban VI**, (1318-89), *Barlolommeo Prignano*, b. at Naples, became archbishop of Bari in 1377, and was elected

in 1378. He came into conflict with the college of cardinals, and with their election of Clement VII. as anti-pope in 1378 began the great W. Schism.

**Urban VII.** (d. 1590) *Giorgio Battista Castagna*, was pope only from Sept. 15 to 27, 1590.

**Urban VIII.** (1568-1644), *Maffeo Barberini*, b. at Florence, had a high reputation for culture and learning. He succeeded Gregory XV. in 1623. In the difficult position of Rom. affairs, as complicated between France, Austria, and Spain, in the war of the Valtellina, he acquitted himself with much dexterity. His pontificate was also signalised by the acquisition by the Holy See of the duchy of Urbino in 1626. He was the founder of the celebrated College of Propaganda, and to him Rome is indebted for many public works, including large and important additions to the Vatican library.

See F. Hayward, *History of the Popes* (Eng. trans. 1931).

**Urbana**, co. seat of Champaign co. Illinois, U.S.A., 61 m. N.W. of Terre Haute; the site of the Illinois Univ. and State laboratory. Pop. 14,100.

**Urbino** (Lat. *Urbium Hortense*), tn. in the prov. of Pesaro e U., the Marche, Italy, between the Foglia and Metauro, 23 m. S. by E. of Rimini. It has a fine feudal palace of the Montefeltro family (1468), a cathedral, free univ. (1564), and the house in which Raphael was b. (1483). The manufs. include silk, majolica, bricks, and olive oil. Pop. 20,000.

**Urogha**, see *ORUGHA*.

**Urdu**, see *HINDUSTANI LANGUAGE AND LITERATURE*.

**Ure**, riv. of the N. and W. Ridings, Yorkshire, England, which rises 7 m. S.W. of Muker near the borders of Westmorland. It is about 70 m. long and joins the Swale, forming the Ouse.

**Urea**, or **Carbamide**  $\text{CO}(\text{NH}_2)_2$ , compound which occurs in the urine of mammals and of carnivorous birds and reptiles. It forms about 3 per cent of human urine. It may be prepared from urine by evaporation to small bulk and adding strong nitric acid. The precipitated crude U. nitrate is recrystallised from nitric acid and dissolved in water. The solution is then decomposed with barium carbonate, evaporated to dryness, and the urea extracted with alcohol. In the laboratory, U. is more commonly prepared by heating ammonium cyanate. It forms colourless crystals (melting point  $132^\circ \text{C}$ .) soluble in water and alcohol, and combines with acids to form salts. It is decomposed on heating, and heated with sodium hypobromite gives off nitrogen. This latter property is used as a method of estimation. U. was discovered in urine in 1773, and was artificially produced by Wohler in 1828, the discovery being of fundamental importance as the first indubitable example of isomerism (*q.v.*). U. is nowadays manufactured on a fairly large scale from calcium cyanamide, for use as an artificial manure; it is also used in the manufacture of a clear synthetic resin, and in the preparation of various drugs, *e.g.* veronal (*q.v.*). See also under *PLASTICS*.

See E. A. Werner, *The Chemistry of Urea*, 1923, and P. Karrer, *Organic Chemistry*, 1947.

**Urea-formaldehyde**, see under *PLASTICS*.  
**Urey**, Harold Clayton (b. 1893), Amer. scientist, b. at Walkerton, Indiana, educated at Montana Univ. and the Univ. of California (Ph.D.). He was associate prof. of chemistry Columbia Univ. (1929-34), prof. (1934-45), executive officer, dept. of chemistry (1939-42), director of War Research Atomic Bomb Project (1940-45), prof. of chemistry, Univ. of Chicago, since 1945. In 1934 he was awarded the Nobel prize for chemistry for his discovery of heavy hydrogen.

**Urfa**: 1. Prov. of Turkey, has a S. boundary with Syria. Pop. 267,600. 2. Cap. of the above, see *EMESSA*.

**Urga**, since 1924 **Ulan Bator** **Hoto**, cap. of the republic of Outer Mongolia, on the R. Tola, 170 m. S. of Kiachta. The city is important as containing the residence of the Hutukta Lama, the head of the Mongolian Buddhists. Pop. 100,000.

**Uri**, one of the forest cantons of Switzerland. It is bounded by the Lake of Lucerne and the cantons of Schwyz, Glarus, Grisons, Ticino, Valais, Bern, and Unterwalden. The prin. river is the Reuss, whilst the St. Gotthard Railway crosses the canton. Cattle-rearing is carried on, also cheese-making and bee-keeping, but more than half the surface is barren rock or glaciers. The chief tn. is Aldorf. Area 415 sq. m. Pop. 27,300 (Principally Rom. Catholics).

**Urial**, **Orial**, or *Ovis vignei*, known also as the Punjab wild sheep, a species of the genus *Ovis*, found chiefly in the Punjab, Afghanistan and Persia.

**Uriburu** (formerly **Zarate**), tn. of Argentina in the prov. of Buenos Aires, on the Paraná R., 56 m. N.N.W. of the cap. Pop. 30,000.

**Uric Acid**  $(\text{C}_5\text{H}_4\text{N}_4\text{O}_6)$ , product of the metabolism of the animal organism, and occurs in small quantities in human urine. It sometimes accumulates in the bladder, forming 'stones,' or is deposited in the tissues of the body (gout and rheumatism). The excrements of birds (guano) and of reptiles contain large quantities of the acid. Serpents' excrements consist chiefly of ammonium urate, and the U. A. is prepared by boiling with caustic soda and the clear alkaline solution precipitated with hydrochloric acid. The acid form-crystals which are insoluble in water. Evaporated with nitric acid, a yellow stain is left, which becomes intensely violet on addition of ammonia. U. A. is a weak dibasic acid, and forms salts which are all sparingly soluble in water. The lithium salt is fairly soluble, and hence lithium compounds are used in medicine for gout and rheumatism, etc., though with doubtful efficacy.

**Urionium**, see under *SHIRASURY*.  
**Urinary Calculus**, see *CALCULUS*.

**Urine**, fluid excreted by the kidneys. It contains a large proportion of water as well as some of the waste products of metabolism. The kidneys extract these waste products from the blood and pour their secretions into the ureter, by which

the fluid reaches the bladder, there to be retained for a while until it is discharged to the exterior by the urethra. It is not known how the U. is formed in the kidneys, though it is probable that the different constituents are secreted in different parts of the kidney tubule. The water and some salts are separated out at the glomerulus at the commencement of each tubule, and the other constituents are added in the convolutions before the U. reaches the pelvis of the kidney. U. as excreted is normally a clear amber liquid of sp. gr. about 1.02 and an acid reaction. It is a very complex liquid. The bulk of it is water, in which are dissolved mineral salts and organic substances, mainly nitrogenous.

The most important of the nitrogenous products in the U. is urica  $\text{CO}(\text{NH}_2)_2$  (q.v.), which contains about ninety per cent of the total nitrogen excreted. U. is formed from the amino-acids resulting from the digestion of proteins. About 4 per cent of the nitrogen in U. is contained in ammonia, which can often be detected by its odour. Other nitrogenous substances present in U. are uric acid, hippuric acid, and creatinin. Uric acid is present in excess in the U. of gouty patients. The amount of U. discharged by an adult man is about  $2\frac{1}{2}$  pints daily on the average. For abnormalities of the urinal system see under UROLOGY.

**Urmia**, see UROMIAH.

**Urmston**, urb. dist. of Lancashire, England, 5 m. from Manchester. It is in an industrial estate. Pop. 38,600.

**Urn Burial**, see under BURIAL CUSTOMS.

**Urnas**, see under VIKING ART.

**Urodela**, see CAUDATA.

**Urology**, study of the structure, affections, and diseases of the genito-urinary system. The chief parts of the urinary system are the kidneys (q.v.), ureters, bladder (q.v.), and urethra. Impairment of function is the concern of U. and may be due to abnormalities in the development, number, and position of the kidneys. In addition to abnormalities, displacements, and injuries, kidneys may be affected by syphilis (q.v.), tuberculosis (q.v.), pyelonephritis, tumours (q.v.), hydronephrosis, and other diseases. The chief abnormalities of the ureters, the ducts conveying the urine from the kidney to the bladder, are dilations and constrictions, abnormal bends and twists; the origin of the ureter from a position too high to drain the kidney; blind endings and the opening of the ureters into parts of the genito-urinary system other than the bladder. Ureteritis is frequently associated with infection of the kidney. Not infrequently the passage of the ureter is partially or completely blocked by calculi, by tumours, and by strictures due to various infections. Some anomalies of the bladder, particularly extrophy, increase the possibility of the growth of a carcinoma (see CANCER). (For cystitis, see under BLADDER.) Diseases of the genito-urinary system are frequently associated with neuroses. These may be the cause of such physiological manifestations as dysuria (difficulty in passing urine),

enuria (bed wetting), urgency, retention, polyuria (excess of urine), impotence, and sterility. Conversely, any of these affections due to injury, abnormality, or disease may be the cause of a neurosis. Abnormalities of function may also be produced by disturbances of the endocrine system. Genital diseases are of particular importance since they affect the health, not only of the individual, but also of the next generation, and they may result in complete sterility. Organisms from a mother infected with venereal disease, particularly with gonorrhoea (q.v.), are likely to infect the child during parturition. U. is concerned with defects in the development of spermatozoa, with faults of insemination, and with the production of secretions harmful to semen in either the male or female passages. The study of the genital abnormalities and diseases of women is a specialised branch—gynaecology (q.v.).

**Uratropine**, see HEXAMINE.

**Urquhart, Sir Thomas** (1611–60), Scottish author and translator, educated at King's College, Aberdeen; his education being completed with the usual continental tour. During the civil war he was a royalist. In 1653 was pub. the first part of the work that has made his name famous, the trans. of Rabelais, one of the most perfect trans. ever made. It has been reprinted in the Everyman's Library, 1929. See J. Wilcock, *Sir Thomas Urquhart, Knight*, 1899; and H. Brown, *Rabelais in English Literature*, 1933.

**Ursa Major** (the Great Bear) one of the best known of all the constellations, can be easily found as it is never completely below the horizon in the Brit. Isles, though some portions of it cannot be seen in the most N. parts of Scotland. No one can mistake the seven stars in this constellation, these are known as the Plough, the Wagon, Charles's Wain, and also as the Dipper in America. It should be noticed that U. M. contains not only these seven stars but also scores of others and it is necessary to avoid a common error of identifying 'the Plough,' etc., with the whole constellation. The first two stars of the Plough, known also as  $\alpha$  and  $\beta$  Ursa Majoris, are called 'the Pointers' because an imaginary line drawn through them points to the pole star—the nearest bright star to the celestial pole (it is now less than  $1^\circ$  from it). By prolonging the line through the two stars at the other end of the Plough, known as  $\zeta$  and  $\eta$  Ursa Majoris, it will pass fairly close to the bright star Arcturus in the constellation of Boötes.  $\gamma$  Ursa Majoris, also known as Mizar, has a faint companion near it which can be detected with the naked eye. This companion is known as Alcor, and when a small telescope is used Mizar is seen to be a double star. Mizar is a spectroscopic binary, its companion being about 140 million miles from it, and revolving around it in 20 days. It is remarkable that all the stars in the Plough with the exception of the first and last, that is  $\alpha$  and  $\eta$ , are moving in the same direction and different stars scat-

tered throughout the sky, such as Sirius,  $\beta$  Aurigae, and others share in this motion.

**Ursa Minor** (the Little Bear), small constellation chiefly remarkable for the fact that Polaris (the Pole Star) is situated at the end of its tail. The parallax of Polaris was found to be 0.076, which indicates a distance in light-years of 42.45.

**Urso**, see ONSA.

**Ursula, Saint, of Cologne**, Ger. saint, is said by the anc. legend to have been put to death at this place some time in the fourth century probably under Diocletian, together with eleven thousand virgins, her companions. Even in the Middle Ages this popular story was viewed by many with suspicion, and it now universally recognised that the greater part of it is fabulous.

**Ursulines**, order of nuns in the Rom. Catholic Church founded about 1537 by Angela de' Merici (1474-1540). Its institution was confirmed by Paul III. in 1544, and it was at this time that the order received its name, from that of its patron, St. Ursula. The nuns are employed in educational work, the U. being the first specifically teaching order of women.

**Urticaria**, see NETTLE-RASH.

**Uruguay**, riv. of S. America, forming, with the Paraná, the R. Plate (*q.v.*). For the lowest 400 m. of its course of 1000 m. it forms the Argentine-Uruguayan frontier. The Rio Negro is its chief affluent.

**Uruguay**, known as the **Republica Oriental Del Uruguay**, smallest republic in S. America, situated between Brazil and Argentina, on the Atlantic coast. Its area is 72,153 sq. m. and its estimated (1947) pop. is 2,250,000 of which some 770,000 live in Montevideo.

**Physical features**.—There is a S. fringe of alluvial land bordering the lower U. riv. and the Rio Plata N. of Colonia, but most of the country is hilly with soils derived from crystalline rocks, while some of the more prominent ridges are crowned with huge granite blocks. On the E. coast there is a zone of lowland, composed of sandy beaches, dunes, and lagoons. Inland from this is a belt of hills extending from S. Brazil southward to the S. coast of U. near Montevideo and extending along the divide between the shorter streams flowing directly to the Atlantic and the longer streams flowing westward to the U. river. The summits along the Cuchilla Grande, as the divide is called, reach a height of 2000 ft. Westward from the divide the land slopes gently to the U. riv.: along the divide the valleys are narrow and the streams turbulent but, lower down, along the divide, the valleys broaden out, sometimes developing small flood plains. The chief rivs. are the U. and the Negro. Vegetation and climate are transitional between the Argentine humid pampa and S. Brazil.

**Production**.—The major commercial products in order of value are wool, beef, canned meats, hides and skins, linseed, wheat, sand, and stone. Meat-packing plants have been estab., e.g. the Liebig plant at Fray Bentos. Wool too, became an important export and is now the largest

single item of commerce. High grade wool and mutton sheep were introduced in 1840. Today herds of high grade merino sheep are a characteristic feature of Uruguayan rural life. Immediately before the Second World War U. was credited with nearly 40 per cent of all Lat. Amer. wool exports. While pastoral life and products dominate the economic system of U. there is nonetheless an important agric. zone. There are about 100,000 farms. In this small well-defined zone, wheat covers over half of the land devoted to crops and half is grown for domestic consumption; flax, linseed, and rice are regularly exported and oats and maize are grown. Skins of various fur-bearing animals, notably nutria and seal-skin, are collected for market and exported. Whaling is carried on from Montevideo, the winter anchorage of some Brit. and Scandinavian whaling flotillas. Lead, copper, and manganese, and a little gold and silver are mined; also lignite coal and some iron.

**Population**.—U. is divided into nineteen depts. The pop., almost entirely white, was estimated in Dec. 1917 at 2,318,320.

The chief cities and tns., with estimated pop. in 1949 are: Montevideo City (cap. of the State and one of the great cities of S. America), 770,000; Paysandú, 50,000; Salto, 48,000; Mercedes, 33,000; Minas, 30,000; Tacuarembó, 30,000; Rocha, 28,000; Melo, 27,000; Treinta y Tres, 22,000; Artigas, 22,000; Rivera, 21,000; and Fray Bentos, 18,000.

**Administration**.—The first constitution of U. was that of 18 July, 1830, adopted two years after the achievement of Uruguayan independence of Brazil. The next constitution, that of 1919, was abolished in 1934, the present constitution being approved by a Constituent Assembly on May 18 of that year. Under the Constitution of 1934, as subsequently modified by the law of May 29, 1942, the president of the republic is elected by the legislature for a term of four years and is eligible for re-election after four years have elapsed since the date when his mandate ended. The executive power is vested in the president, assisted by a council of nine ministers. The legislature consists of a chamber of 99 deputies and of a senate of 30 members, elected under proportional representation for four years. All adult literate citizens male and female have the vote. Parliamentary and municipal elections are held simultaneously every four years. An absolute majority in both houses of Parliament is necessary before fresh taxation can be levied. Revenue bills cannot be originated by Parliament and must be introduced by the gov. U. is one of the most advanced of all the Lat.-American States in the provision of state-controlled social services. There is a supreme court of five judges elected by Congress (*i.e.* the two chambers sitting as a national assembly), with original jurisdiction in constitutional and admiralty cases, and an appellate jurisdiction in cases from the three courts of appeal, each

of which latter has three judges appointed by the supreme court. In Montevideo there are also three courts for ordinary civil cases, seven for commercial cases, and a number of criminal and correctional courts. Each departmental capital also has a departmental court and each of the judicial sections into which the republic is divided has a justice of the peace; and there are also a large number of *alcades* or deputy-judges for the trial of district cases involving small pecuniary issues.

*Religion and education.*—The majority

are also about 6000 m. of departmental roads. The roads of U. are amongst the best in S. America. Railways in U. are now all State-owned. The four Brit. companies were sold to U. in 1948, and continue under State ownership as a separate administration called the Central Uruguayan Railway. The total railway system open for traffic is 1875 m. of standard gauge. There are 775 m. of navigable riverways. Carrasco is the chief airport.

*History.*—During the colonial period U. was remote from the centres of both



MONTEVIDEO. THE PLAZA INDEPENDENCIA

E.N.A

of the pop. is Rom. Catholic but no religion is established by the State and there is complete religious liberty in U. Primary education has been free and compulsory since 1877, and the proportion of illiterates is lower than in most Latin-American countries. There are over 1600 State schools with nearly 200,000 enrolled pupils and about 5800 teachers. The univ. of Uruguay at Montevideo, was inaugurated in 1849. The language of the country is Spanish.

*Defence.*—The army consists of the active force recruited on a voluntary basis and its reserves. There are nine regiments of cavalry, five each of artillery and infantry, one tank regiment, and six pioneer regiments. There is a small naval force, in addition to a small air force.

*Finance.*—Revenue for 1947 was budgeted at \$206,599,000 and expenditure for 1946 was stated to be \$171,000,000. The theoretical gold coin monetary unit is the *peso oro*. In July 1950 the rate to the £ sterling was 6.65.

*Communications.*—The national roads have a total length of 2600 m. and there

Portuguese and Sp. settlements. Yet by 1680 the Portuguese had advanced southward to the Plata shore and built a fortress at Colonia opposite Buenos Aires. Remoteness from the Sp. settlements on the humid pampa was due to the riv. barrier, the Parana-Plata, wide and bordered by a labyrinth of swamps and shifting channels, making travel impracticable. The E. shore (called the Banda Oriental) of the Plata was occupied by nomadic herdsmen or *gauchos*. Cattle were introduced about 1603 and allowed to run wild and multiply. The institution of land ownership as distinct from ranch headquarters came only gradually, but eventually the landowners replaced the *gauchos* with hired workers and peons. As this type of rural settlement spread northward small vil. and tns. began to be built, generally at road junctions. U. became a country of small scattered ranches. Montevideo was founded by the Spaniards in 1726, and eventually became chief urb. centre of the Banda Oriental. National independence came to U. as a result of influences beyond its borders.



When Brazil declared its independence in 1822 U. was included as part of Brazilian national ter. In 1825 an Argentine army invaded the Banda Oriental, drove the Brazilians northward, and gained control of the whole of what is now U. When it looked as if Argentina might be in a position to control both banks of the Plata, the Brit. intervened and, in the subsequent peace negotiations (1828), they secured the agreement of both Argentina and Brazil to the estab. of an independent U. as a buffer state. It is now one of the most prosperous States in S. America. Leading industries, banks, public utilities, etc., have been nationalised. U. declared war on Germany and Japan on Feb. 22, 1945, and later became a foundation member of the United Nations. See R. J. Enoch, *Republics of South America*, 1913; M. J. G. Ross, *Argentina and Uruguay*, 1917; W. Parker, *Uruguayans of To-day*, 1921; J. Supervielle, *Uruguay*, 1928; E. Acevedo, *Anales Historicos del Uruguay*, 1933; S. G. Hanson, *Utopia in Uruguay*, 1938; P. E. James, *Latin America*, 1942; J. Salgado, *Historia de la Republica Oriental del Uruguay*, 1943; *South American Handbook* (ann.).

**Urumchi**, see TIHWA.

**Urmia, Urmia, or Daria Shah**, lake of Persia, in the prov. of Azerbaijan, situated in a depression between the mts. at a height of 4500 ft. It is very salty and is fed by the Aji Chai, Jaghatu, Tatan, and Zula. Its outlet is unknown. Its length is about 90 m., breadth 20-30 m., and area 1600 sq. m.

**Urumiah, Oroomiah, or Urmia**, tn. in the Persian prov. of Azerbaijan, 70 m. S.W. of Tabriz. It is a summer resort, the see of a Nestorian bishop, and is supposed to have been the bp. of Zo-roaster. Pop. 20,000.

**Urundi**, see RUANDY-URUNDI.

**Urville, Jules Sebastian Cesar Dumont d'**, see DUMONT.

**Uryankhai**, see TANNA-TUA.

**Usages**, see CUSTOMS.

**Usambara**, dist. of Tanganyika ne. of the Kenya border and also the name of a mt. range in the Tanga prov.

**Usbeks**, see UZBEKS.

**Usedom**, is. of Mecklenburg, Germany, off the Baltic coast, N. of the Stettiner Haff. Its surface is flat and mostly moorland and marshes. Pop. 47,000.

**Usertsen**, see SESOSTRIS.

**Uses**, in law, the benefit or profit of lands considered as detached from and opposed to the legal ownership, or seisin (q.v.). Use implies a trust or confidence reposed in someone for the holding of lands, and all modern conveyances are directly or indirectly founded on the doctrine of U. and trusts, which doctrine has rightly been regarded as the most technical and intricate part of the real property law of England (cf. SCINTILLA JURIS). The doctrine was a purely equitable one, and was employed by eccles. corporations to evade the statute of mortmain (see CHARITABLE TRUSTS; and MORTMAINS), and by landowners to evade feudal burdens, or to make land devisable by will at a time when that was impossible

by common law (q.v.). The effect of the statute of U., 1535, the object of which was, by *executing* the use or turning it into the full legal estate, to circumvent the above devices, was not what the legislature had hoped; because the courts soon held that only the first and not subsequent uses was executed; hence if A left land 'to B to the use of C to the use of D,' C had the legal but D the beneficial ownership. These judicial decisions defeated the main policy of the statute, and restored U. under the now more familiar name of trusts (q.v.), and hence brought about the whole modern system of 'equitable estates.' If land be conveyed to A to the use of B, B has the possession vested in him; but if the conveyance be to A, to the use of B *in trust* to permit C to enjoy the profits, B has the legal, but C the equitable, estate (q.v.). U. apply only to lands of inheritance and therefore are inapplicable to leaseholds. On the equitable doctrine of the 'separate use' by which property given to a woman was free from her husband's control, see under HUSBAND AND WIFE; RESTRAINT UPON ANTI-CIPATION; and SCOTS LAW.

**Ushant (Fr. Ouessant)**, is. in the dept. of Finistere, France, 27 m. N.W. of Brest. It has steep coasts, with a fertile soil; fishing is the chief industry, and the small port of Ouessant on the S.W. is the only tn. There are two lighthouses and a telegraph and a life-boat station. There were two battles fought off Cape U. in the eighteenth century. The first was between the Fr. under D'Orvilliers and the Eng. under Keppel in 1778 and was indecisive. The second was fought on the 'Glorious First of June, 1794,' when Admiral Lord Howe gained a great victory over the Fr. under Villaret-Joyeuse, capturing seven vessels. (See NAVY AND NAVIES).

**Ushas**, Hindu goddess of the dawn to whom Vedic hymns are addressed.

**Ushaw**, vil. of Durham, England, 4 m. from Durham. It has a Rom. Catholic training college dedicated to St. Cathbert, which was founded in 1804 for student refugees from Douai.

**Usk**, par and mrkt. tn. of Monmouthshire, England, 6½ m. E. of Pontypool and 12 m. S.W. of Monmouth, on the site of a Rom. settlement. There are remains of a twelfth-century castle, and the church was originally attached to a thirteenth-century Benedictine nunnery. Nylon is manufactured, and there is salmon fishing and trade in agric. produce. Pop. 1600.

**Usk (Welsh Wysg)**, riv. of Brecon and Monmouth, rising in the Black Mts. where Brecon meets Carmarthenshire, and flowing S.E. into the Bristol Channel at Newport. It has a length of 57 m. and is noted for its salmon while good trout are obtainable in its tribs., the Olwy and the Berthon. The U. valley is famous for its beautiful scenery, and is the site of one of the protected national parks. Some seven m. from U. is Caerleon (q.v.), noted for its Rom. amphitheatre. The riv. becomes industrial only at its mouth.

**Uskub**, see SKOPLJE.

**Uskurdur**, see SCUTARI.

**Uspallata**, see CUMBRE, LA.

**Usquemonds**, see ESKIMO.

**Ustil.** see AUSSIG.

**Ustilaginaceae**, see under SMUT.

**Usika**, see under STOLP.

**Ust-Sysolsk**, see SYKTYVKAN.

**Usufruct**, in Rom. law, the temporary use and enjoyment of lands or tenements, or the right of receiving the fruits and profits of lands or personal property belonging to another, without having the right to alienate or change the *corpus* or property itself.

**Usury**, formerly denoted any legal interest for the use of money, but in present usage denotes only illegal or excessive interest. Many early laws of the Church prohibited U. of any kind. See INTEREST and MONEYLENDER.

**Utah**, the 'Beehive State,' since 1896 a state of the U.S.A., and confined by Nevada (W.), Idaho and Wyoming (N.), Colorado (E.), and Arizona (S.). The Wasatch Mts. (highest peak Timpanogos, 11,957 ft.) shut off the W. section, which belongs to the Great Basin of the continent and consists of highlands running N. to S. separated by valleys of desert wastes, from the E., which belongs to the Colorado basin, and is remarkable for its lofty plateau through which big canyons carve their passage. Zion and Bryce Canyon National Parks are in this area, and in the former evidence of a prehistoric people has been found. The colouring and erosional formation of the canyons are unsurpassed. The Vinta Mts., though an offshoot of the longer range already mentioned, contain the greatest elevations in the State, the culminating summit being King's Peaks (13,498 ft.). The climate is dry, rather cold in winter and warm in summer. A notable feature is the Great Salt Lake, 80 m. long, 25 m. wide, and almost 20 per cent salt. Every attempt is being made to reclaim by irrigation the vast tracts of unfertile soil, and 1,176,000 ac. are thus watered at present. The chief crops are those of wheat, oats, potatoes, rye, corn, barley, alfalfa (876,000 tons in 1946), and hay; the growth of nursery produce and fruits is also greatly encouraged. From 1939 to 1947 the State's income from agriculture was more than doubled. Cattle and sheep-raising are important. The wool-clip in U., in 1947 yielded over 13,500,000 lbs. In 1947 there were approximately 1,646,000 sheep, and 550,000 head of cattle. The wonderful development of U.'s agric. resources has caused the mining industry, though increasing in value to take second place. Copper, and after that silver, zinc, coal, lead, and gold (in which U. leads), are the most valuable minerals. Mineral production in 1946 was valued at 96,774,000 dollars. Since the Second World War, U. has become an important producer of steel: the Geneva Steel Mills have an ann. capacity of 1,250,000 tons. The manuf. of flour and of railway cars, and also printing, are important, and there are copper and lead smelting works, beet-sugar factories, canning and preserving of fruit and vegetables, grain and flour-mill products, slaughtering and meat-packing,

and the manuf. of butter, cheese, and confectionery.

Brigham Young and his 150 followers (see MORMONS) entered Salt Lake Valley in 1847. A year later U. was ceded to the U.S.A. by Mexico, and was organised as a ter. in 1850. On Jan 4, 1896, it was admitted as a state into the Union. It is ruled by a Senate and House of Representatives and sends two representatives to Congress. 1,774,486 ac. are given over to Indian tribes. School attendance is compulsory between eight and eighteen years of age. There are the agric. college at Logan, the Brigham Young Univ. at Provo, as well as many other colleges. The Latter-Day Saints comprise three-fourths of all church membership. Area 84,916 sq. m.; pop. 637,000; the chief cities being Salt Lake City, 150,000; Ogden, 44,000; Provo 18,100.

**Utakamund**, or **Ootacamund**, municipality and tn. in the dist. of Nilgiri Hills, Madras, India, 36 m. N.N.W. of Coimbatore. It is 7000 ft. above the sea, and is the prin. sanatorium and summer resort of the presidency. Pop. 29,900.

**Utamaro** (1754-1806), Jap. artist of the Ukiyoe school, known chiefly by his coloured wood-cuts, *b.* at Yedo. U. was the first Jap. artist to become well known in Europe, many of his prints being sent there during his lifetime by Dutch merchants resident at Nagasaki. See C. S. Ricketts, *Pages on Art*, 1913; and lives by E. de Goncourt, 1891; J. Kurth, 1907; and Y. Noguchi, 1932.

**Uterus**, or **Womb**, organ in which the development of the ovum takes place. It is a pear-shaped organ, flattened and about 3 in. long in the non-pregnant condition. Its position is between the bladder and the rectum, with the base directed forwards and upwards; the cylindrical neck or *cervix* is directed towards the vagina, with which it communicates by the *os uteri externum*. This orifice is small and elliptical in the virgin, but after pregnancy remains much wider. The wide portion, or *fundus*, of the U. receives the Fallopian tubes at its two upper angles. The fundus is triangular in form, the apex being a constriction called the *os uteri internum* leading to the cervix. The walls of the U. consist of mucous membrane as its inner surface continuous with that of the vagina, a thick layer of muscular tissue, and an outer surface of peritoneum. The peritoneum is reflected outward to the wall of the pelvis and forms a means of suspension for the organ. This arrangement not only provides for a great degree of mobility, but also allows for considerable distension in pregnancy. During the period of sexual activity, from puberty to the menopause, the U. discharges about 6 oz. of blood and mucus at intervals of twenty-eight or thirty days. The chief function of the U. is, however, the development of the fertilised ovum. The ova are carried from the ovary to the U. by way of the Fallopian tubes. After the ovum has been fertilised, it depends for the nourishment necessary for development on the

U., which is furnished with structures adapted to that end and for carrying away the waste products of the fetus. The U. is the seat of many disorders, which are dealt with in that branch of medicine known as gynecology (*q.v.*). Owing to its mobile situation, the organ is subject to many varieties of displacement. Inflammation of the mucous lining of the U. is called endometritis. It is due to the extension of infective inflammation from other structures, or to sepsis following the expulsion of the fetus. Treatment consists of irrigation with antiseptic fluids, with care of the general health. The U. is a very common seat of tumours, both benign and malignant. Surgical treatment at an early period of the disease often leads to the cure of cancer of the U. See also GYNECOLOGY.

**Utica**, anc. city of N. Africa, situated 25 m. N.W. of Carthage in the present dist. of Tunis. It was founded by the Phœnicians in 1101 B.C., and after the destruction of Carthage (146 B.C.) rose to be the first city of Africa, and cap. of the Rom. prov.

**Utica**, city and co. seat of Oneida co., New York, U.S.A., on the R. Mohawk. It is a railway and canal centre, and has manufs. of cotton goods, hosiery, engines, etc., iron and brass castings, firearms, boots and shoes, etc. Pop. (1940) 100,500.

**Utilitarianism**, may be summarised by its own catch-phrase, 'the greatest happiness of the greatest number,' such happiness being the criterion of ethical right and wrong, and pleasure and freedom from pain the only desirable ends of life. The term originated with Bentham as a purely philosophical and political expression. His *Principles of Morals and Legislation* (1789) must be regarded as the origin of the movement which culminated in John Stuart Mill. Mill defined U. as 'the creed which accepts as the foundation of morals utility, or the greatest happiness principle, holds that actions are right in proportion as they tend to promote happiness, wrong as they tend to produce the reverse of happiness.' A new aspect of U., considered on biological or evolutionary grounds, was pointed out in Darwin's *Descent of Man*, and followed up by Herbert Spencer and Sir Leslie Stephen. The name of Henry Sidgwick (*The Methods of Ethics*, 1874) must also be mentioned in connection with purely philosophical U. See Sir L. Stephen *English Utilitarians*, 1900; E. Albee *History of English Utilitarianism*, 1902; J. S. Mill's masterly *Utilitarianism*, 1863, (reprinted in Everyman's Library) the best exposition, philosophical and literary of the doctrine of U.; and J. Flamenatz, *The English Utilitarians*, 1949.

**Utopia**, (nowhere; Gk. *ou*, not and *topos*, place) name given by Sir Thomas More to the imaginary is. of his *De Optimo Reipublicæ Statu, deque Nova Insula Utopia* (1516). From it the adjective Utopian has been formed to mean 'impracticable,' or 'ideal.' See More's *Utopia* in Everyman's Library.

**Utraquists**, see under HERETICS, WARS OF THE.

**Utrecht**: 1. Prov. of the Netherlands. The soil is sandy and sterile in the E., but more fertile in the W. Dairy products and livestock are important; fruit, vegetables, and cereals are grown. Area 535 sq. m. Pop. 573,400. 2. Cap. of the above, situated on the Old Rhine, 38 m. E. of The Hague. It is the seat of a Rom. Catholic and of the Old Catholic archbishopric. Among the prin. buildings are the fine Gothic cathedral (damaged by a hurricane in 1674), the univ. (founded 1636), and an archiepiscopal museum. The chief manufs. are cloth, woollen goods, carpets, pottery, organs, chemical products, engineering goods, gin, etc. U. is very anc., being known to the Romans as Trajectum ad Rhenum. The Treaty of U. (1713) was signed here, ending the War of the Sp. Succession. Pop. 93,200. 3. Tn. of Natal, S. Africa. Fruit growing and stock-raising are carried on, wool is produced, and there are rich coal mines. The tn. is the cap. of the dist. of U., which was annexed to Natal in 1903. Pop. 1848.

**Utrillo, Maurice** (b. 1884), Fr. painter, b. in Paris. He was influenced by the Impressionists. His street scenes with their white walls and houses belong to what is known as the 'white Period' from 1907 to 1910. The so-called 'white and blue' period followed, but from 1917 onwards he was more generous in his use of colour and his pictures show a tendency towards architectural subjects. See G. J. Gros, 1927.

**msa**, see VERBANTA.

1. of Staffordshire, England, N.E. of Stafford. Biscuits, and agric. implements are c's grammar school was 'sixteenth century. Pop.

2. of Nystad, seaport tn. m. N.W. of Turku on the ia, in the Åbo-Björneborg stv of Nystad in 1721 gave eas to Russia.

3. pt. of Finland, with a S. ulf of Finland. Land area 4435 sq. m. Pop. 601,700.

**Uvula**: 1. Small cone-shaped hanging process suspended from the middle of the lower border of the soft palate. It is formed by the *azygos uvulae*, *levator palati*, and *tensor palati* muscles, mucous membrane, and connective tissue. 2. Small offshoot of the inferior vermis of the cerebellum, constituting the posterior limit of the fourth ventricle. 3. Slight elevation of mucous membrane projecting from the anterior and lower part of the bladder to the urethral orifice. This is known as the uvula vesicae.

**Uxbridge**, urb. dist. and mkt. tn. of Middlesex, England, situated on the R. Colne. Brewing, brick-making, iron-founding, light engineering and mkt. gardening are carried on, and there are film studios and an important R.A.F. centre. Here in 1645 the unsuccessful negotiations between parliamentarians and royalists took place. Pop. 55,000.

**Uzbeks**, or **Usbeks**, form a branch of the Turkish family of Tatars. They are

supposed to be of Uigur origin, descended from a tribe which migrated from Kashgaria to W. Turkestan. Their blood is mixed in different localities with Aryan, Kiptchak, Kalmuck, and Kirghiz elements, and as a people they are socially and politically, rather than ethnically, distinct. In Khiva, Bokhara, Khokand, and other places they form the chief part of the native pop., are the influential class, and were dominant until the middle of the nineteenth century, when the Russians arrived and became supreme. The U. speak Jagatai Turkish.

**Uzbekistan**, or **Uzbek S.S.R.**, constituent republic of the U.S.S.R. The old kingdom of U. was formed of the ters, or Bokhara (*q.v.*) and Khiva in Central Asia, which, prior to the revolution of 1917, were under Russian suzerainty. In 1925 U. became an equal member of the Soviet Union. U. is bounded N. by Kazakhstan (*q.v.*), S. by Afghanistan, E. by the Kirghiz S.S.R. and Sinkiang (Chinese Turkestan) and W. by the Turkmen S.S.R. The cap. is Tashkent (*q.v.*). Other tns. include Samarkand, Andizhan, Bokhara, Khokand, and Namangan.

The climate is rather dry, and with extreme variations from summer to winter. U. is a land of intensive farming based on artificial irrigation. It produces some 60 per cent. of the cotton output of Central Asia. The irrigated area increased during 1938-40 by over 600,000 ac. The dam in the Katta-Kurghan valley is one of the largest reservoirs built in the world. The rearing of sheep is one of the oldest occupations of the pastoral pop. of U. Some of the collective farms possess up to 40,000 head of sheep and some state farms as many as 100,000. Grain is grown but not more than sufficient for local consumption. Fruit, grapes, rice, hemp, wool, and silk are also produced. In Kara-Kalpak, in addition to cotton, rice and lucerne are leading crops. The

largest cultivated area is around Tashkent; cotton and sugar-beet are the chief crops. There is an abundance of fish in the estuary of the Amu-Dar'ya. Afforestation has been widely carried out. Oilwells have been estab. near Bokhara and in the Ferghana valley. The ann. production of the Uzbek oilfields now exceeds 700,000 tons, half being refined locally. Of the mineral resources, in addition to oil and coal, copper and non-ferrous metals are mined at Amalyk, near Tashkent. Wolfram, molybdenum, and radium are found and ozocerite deposits are also exploited. New coal deposits of great potentialities were discovered in 1944 and 1947 in the Central Asiatic republics. The most important industries of U. are those based on the products of agric., and of these cotton textiles occupy the leading place, the largest cotton mills being those in Tashkent. Other well developed industries include the manuf. of vegetable oil from cotton seed and agric. machinery at Tashkent; fruit preserving and canning, tanneries, leather and boot manufs. Other industrial products are cement, sulphur, nitrogenous fertilizers, oxygen, paper, jute, and hydroelectric plants. The area is 159,170 sq. m. The pop. numbers 6,282,000, 72 per cent being Uzbeks, and 11 per cent Tajiks. See also CENTRAL ASIA, RUSSIAN, and RUSSIA. See W. Olfesen, *The Emir of Bokhara and his Country*, 1911; E. R. Christie, *Through Khiva to Golden Samarkand*, 1925; A. L. Strong, *Red Star in Samarkand*, 1930; E. S. Bates, *Soviet Asia*, 1942; and R. A. Davies and A. J. Steiger, *Soviet Asia*, 1943.

**Uzhgorod** (Czech **Uzhorod**, Magyar **Ungvár**), tn. of the Ukrainian S.S.R., 80 m. N.N.E. of Debreczen. It became cap. of Ruthenia in Czechoslovakia, after the First World War, and with that area was ceded in 1945 to Russia. Pop. 17,000.

**Uzziah**, see AZARIAH.

# V

**V**, twenty-second letter of the Eng. alphabet, is interchangeable with *u*, *w*, *f*, *b*, and *m*. The anct. Gks. had apparently no *v* sound, but in modern Gk. (which has no *b* sound) the letter *beta* is used for the sound *v*. The Cyrillic alphabet (ancestor of the Russian, Bulgarian, Serbian, and Ukrainian alphabets), descended from the Gk., employed the anct. Gk. *β* for the sound *v*, and added a variation of *beta* for the sound *b*. The Romns. wrote *V* which had the value either of the consonantal *r* or the vocalic *u*, although the fact that they employed one character for both *u* and *r* has induced some scholars to think that the Lat. *u* had the phonetic value of Eng. *v*. However, while in the early Lat. script and even the later Rom. monumental character there appears only the letter *V*, having both the phonetic values (*v* and *u*), in the later Lat. cursive scripts, there is only the letter *U*, but also employed either as *r* or as *u*. Only in the later Middle Ages and in modern times is the *V* constantly employed for the consonantal sound, and *U* for the vowel-sound. The interchangeability of *r* with *f* and *w* appears not only in the anct. Lat. alphabet, where the letter *F* was an indirect descendant of the Gk. *digamma*, but also in the mod. Ger. alphabet, where the letter *v* is pronounced *f*, and the Eng. sound *v* is generally expressed by the letter *w*. In the Polish alphabet there is no letter *v*, and the Eng. sound *v* is represented by the letter *w*. The Eng. letter *r* is phonetically a pressed or medial labial aspirate, bearing the same relation to *f* that *b* does to *p*.

In chemistry, *V* is the symbol for one atom of vanadium, and is also frequently used as a contraction for 'volume.'

**Vaadt**, see **VARD**.

**Vaal**, riv. of S. Africa. trib. of the Orange R., which rises in Mt. Klipstapel, flows W. and S.W., separating the Orange Free State from the Transvaal, and crosses Griqualand W. Since 1912 there has existed on the banks of the riv. one of the many generating stations of the Victoria Falls and Transvaal Power Company, viz. at Vereeniging. The Vaalbank Dam, which is the storage unit of the Vaal-Hartz development scheme, will be the largest artificial lake in the S. hemisphere. There are diamond diggings in and near the bed of this riv.

**Vaasa**, 1. Prov. of Finland on the coast of the Gulf of Bothnia. Area 15,062 sq. m. Pop. 599,800. 2. Cap. of the above, a port on the Klemetsö peninsula. There are manufs. of machinery, woollen goods, soap, and sugar. Pop. 35,600.

**Vaca**, Alvar Nuñez Cabeza de (1490-1564), Sp. colonial governor and explorer, b. at Jerez de la Frontera. He is celebrated in the annals of the conquista-

dores and was the first European who traversed the ter. later known as New Mexico. In 1528 he took part in the expedition of Panphilo (Panfilo) de Narvaez to Florida, in which Narvaez perished. C. de V. and some three companions, however, were cast ashore on the coast of Texas, their subsequent progress forming one of the most remarkable stories of adventure. He was made *adelantado* or administrator of the prov. of Itio de la Plata (1540), and he led an expedition to Paraguay, where he was received as governor (1512-41). Sev. jealous Spaniards intrigued against him, and he was sent to Spain for trial. In 1556 he was acquitted but was not re-instated in his governorship. His reports of the Narvaez expedition led directly to the expeditions of Niza (1539) and Coronado (1540-42). His *Naufragios* was pub. in 1544 (Eng. trans. by B. Smith, 1851). The events of his S. Amer. expedition are narrated in his *Comentarios* (1555).

**Vaccination** (from Lat. *vacca*, a cow), inoculation with cow-pox in order to afford protection against small-pox. The idea of vaccination first occurred to Dr. Edward Jenner (*q.v.*) (1749-1823) in connection with a belief popular in his native co. of Gloucester, that persons infected with cow-pox were thereby rendered immune from small-pox. His views met with opposition among medical men of the best reputation, and it was not until 1798 that he succeeded in demonstrating that vaccinated subjects were immune, at least for a time. *V.* was made compulsory in a number of countries. The opponents of *V.* point, however, to the fact that erysipelas and even syphilis have been caused or communicated by cow-pox inoculation. Now that the use of glycerinated calf lymph is general, the danger of syphilis is obviated, and it is generally conceded that the marked good effects produced by the general practice of *V.* more than compensate for the remarkably few cases in which the inoculation terminates unfortunately.

The first *V.* Act in England, that of 1840, provided means of *V.* but left the use of them to voluntary decision. In 1853 *V.* was made compulsory. The Act of 1898 required parents to procure the *V.* of their children within six months from birth, unless they had within four months of birth satisfied a count of petty sessions that they had a conscientious belief that such *V.* would be injurious to the health of the child.

Under the National Health Service Act of 1946, which came into operation on July 5, 1948, *V.* is no longer compulsory in Great Britain, though it is nonetheless a wise precaution. See **SMALL POX**.

**Vaccine-therapy**, method of curing and preventing infective diseases by inoculation with the causative micro-organisms in a modified form. The theory owes its origin to Dr. Jenner's (*q.v.*) discovery of vaccination (*q.v.*) in the restricted sense.

As a result of the pioneer work of Pasteur (*q.v.*) and also that of Sir Almroth Wright, not only has the method been extended to preventive inoculation of a number of other diseases, but patients have been inoculated while they were actually attacked by the disease, and the hist. of the method shows that it is a valuable addition to therapeutics. The danger to health involved in bacterial infection depends mainly upon the production of toxins or bacterial poisons, which in some cases are extremely virulent. The disease is fought in normal cases by the destruction of bacteria (a work in which the white corpuscles are especially engaged (see PHAGOCYTOSIS), and by the neutralisation of the toxins by substances called anti-toxins, which are elaborated by the body, under the stimulus of the disease-attack. One injection method involves adding to the anti-toxic properties of the blood by the use of anti-toxic sera (see SERUM THERAPEUTICS). In this method the injected serum contains, not bacteria, but only the anti-toxic substances elaborated by the horse or other animal inoculated with the disease. *V.*, on the other hand, involves the injection of the organisms themselves or their products. The principle underlying the method is the stimulation of the healing powers of the body generally to conquer a localised infection. Normal human serum has what is called opsonic action on bacteria; that is, it makes them more susceptible to destruction by the white corpuscles. In any particular case of disease the opsonic power of the patient's serum is compared with that of normal serum, the result being a ratio which is called the opsonic index. The fluctuations in the opsonic index afford a valuable indication as to whether the injection of a vaccine is likely to aid in conquering the disease or not. When the opsonic index is rising (positive phase), it is an indication of increased immunity, which can be still further increased by the stimulus afforded by the injection of a dead culture of the micro-organism. When the opsonic index is falling (negative phase), the injections are discontinued.

The preparation of vaccines in Great Britain consists in making cultures of the bacteria on a suitable medium, adding sterilised saline to form an emulsion, and subsequently heating this long enough to kill the bacteria. Various chemical agents such as formalin and phenol may be employed instead of heat. Before use, the emulsion is standardised by dilution with sterile normal saline until it corresponds with a standard emulsion. Standardisation was originally carried out by counting the number of bacteria per unit volume. When *V.* was first introduced, autogenous vaccines, i.e. vaccines prepared from the bacteria causing the infection, were generally used; in exceptional

cases stock vaccines were employed. The use of the latter has now become much more general, and is of advantage when the infecting bacteria are of the same strain as those in the vaccine. When different strains, such as those of *Bacillus coli*, exist, autogenous vaccine ensures the use of the right strain; others may be useless and even harmful. Whatever its source, *Bacillus typhosus*, the bacterium causing typhoid fever, yields a vaccine giving immunity from typhoid fever in all parts of the world. *Staphylococcus aureus*, a bacterium causing suppuration, is equally useful in the preparation of stock vaccines, but in many other cases, autogenous vaccines are preferable. The prophylactic use of *V.* was considerably extended during both World Wars, when troops were inoculated against cholera (*q.v.*), typhoid and paratyphoid fevers (*q.v.*), and tetanus (*q.v.*). Vaccines are used also as a preventive against plague (see TROPICAL MEDICINE), whooping cough, colds, pneumonia, tuberculosis (*q.v.*).

In the case of some of the infective diseases, such as cholera and plague, re-inoculation must be made frequently, as immunity lasts for only a few months. *V.* is also of great value in the prevention of diphtheria; the material used for inoculation (immunisation) is *toxoid*, i.e. the toxin rendered less harmful by treatment with formalin.

See L. S. Dudgeon, *Bacterial Vaccines and their Position in Therapeutics*, 1921, R. Muir and J. Ritchie, *Manual of Bacteriology* (10th ed.), 1937.

**Vachell**, Horace Annesley (b. 1861), Eng. novelist, educated at Harrow and the Royal Military College, Sandhurst. He has written many novels and plays, and will be remembered especially as the creator of Quinney. Among his novels are *Romance of Judge Ketchum* (1895); *The Hill* (1905); *Quinney's* (1914); *Quinney's Adventures* (1924); and *Now Came Still Evening* (1946). His plays include *Quinney's* (1915) and *Searchlights* (1915). Autobiographies appeared in 1937, 1949 and 1950.

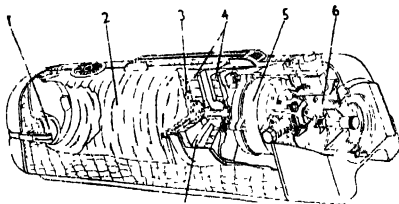
**Vacuum** (physics). A *V.* denotes a space which is completely devoid of matter, but the meaning of the term, as used in physics, is extended to any enclosure in which the gas pressure is considerably less than atmospheric. A *high V.* is one in which the pressure is very low, a *low V.* being one in which the pressure is not so low. Methods of obtaining vacua are described under AIR-PUMP (see also CONDUCTION OF ELECTRICITY). Until the time of Galileo, Aristotle's dictum that 'Nature abhors a vacuum' was accepted as a natural principle. The principle was, however, refuted in the seventeenth century through the so-called *Torricellian V.*, though Torricelli's *V.* was really saturated with mercury vapour at a low pressure (see also TORRICELLI, EVANGELISTA). It is impossible to obtain a perfect *V.*, present methods of exhaustion always leaving some residual gas. A *V.* is a non-conductor of heat and will not transmit sound waves. Heat, light, and

other electro-magnetic radiations are transmitted through a V., just as they are through interstellar space.

Modern 'molecular pumps' can, however, reduce the pressure inside a vessel to well below  $10^{-4}$  mm. of mercury, a pressure of the order of  $10^{-5}$  of atmospheric pressure. The vacua obtained by means of pumps can be increased by introducing substances which absorb gases, such as activated charcoal and phosphorous and the best modern pumps can produce vacua of approximately  $10^{-7}$  mm. of mercury, a pressure of the order  $10^{-10}$  of atmospheric pressure at sea level.

**Vacuum Cleaners**, type of air suction pump used for extracting dust from carpets, furnishings, etc. The first V.Cs., which were invented at the beginning of the present century, were operated by hand, and worked by means of a double bellows.

The modern type of domestic suction cleaner is operated by means of a high speed electric motor. The nozzle communicates with a dustbag which collects the dust and filters the dust laden air on its way out into the atmosphere. The fan that produces the suction is situated in the airways and is usually directly coupled to the armature shaft. Domestic suction cleaners are divided roughly into two types: (a) those which operate by means of a relatively high suction, and (b) those which have less suction and utilise some form of agitator, usually a revolving brush, which beats the surface of the carpet thus distributing the dirt which is picked up by the air stream and conveyed to the dustbag. A machine of the type described under (a) is illustrated. The cleaning nozzle is usually connected to the machine by rods and a flexible hose thus giving a wide range of use. The dust-laden air is drawn up the rods and hose and through the socket (1) into the dustbag (2) which filters the air, the dust, etc., being retained in the bag and the filtered air passing through the perforated plate (3) into the fan (4) and a stationary air guide (7) from which it is passed around the motor (5) to the air purification pad (6) where the air is



Electrolux

VACUUM CLEANER

further filtered and purified before passing out of the blowing end of the machine into the atmosphere. The cost of running domestic cleaners is very low as in most cases they do not require more than one-

third of a unit of electricity per hour.

**Vacuum Flask.** The V. F. was invented by Sir James Dewar to store liquid air. Very little heat enters by conduction because glass is a bad conductor, and the vacuum between the glass walls is a worse one. This vacuum, if perfect, would entirely prevent convection. But a vacuum favours the passage of radiation, so the walls are silvered inside the vacuum. Any heat getting into the vacuum is reflected back. The idea has since been commercialised as the 'thermos flask,' it keeps liquids hot for the same reasons that it will keep liquids cool.

**Vacuum Pump, see AIR PUMP.**

**Vacuum Tubes, see VALVES; see also under FLUORESCENCE, NEON, SPECTRUM AND SPECTROSCOPE, and X-RAYS.**

**Vaduz**, cap. of Liechtenstein, on the r.b. of the Rhine. Above the tn. stands the castle of the ruling house. Textiles are made. Pop. 2000.

**Vagrants**, in law connote idle and disorderly persons of any of three grades liable to various terms of imprisonment. These grades are defined by statute as idle and disorderly persons, rogues, and vagabonds, and incorrigible rogues. In the fifteenth century many laws were passed against 'vagrabonds,' as they were generally called, and persons who could not find employment seem to have been confounded with those who preferred idleness and thieving. Laws against vagabonds in the sixteenth century were closely connected with compulsory labour, and under these circumstances harsh and cruel statutes were passed in the reigns from Edward VI. to Elizabeth. In 1713 an Act was passed for reducing the laws relating to rogues, vagabonds, sturdy beggars, and vagrants into one Act and for more effectually punishing them and sending them to their homes, the manner of conveying them including whipping in every co., through which they passed. This Act was repealed and replaced by the Consolidation Act of 1740, which made a distinction between idle and disorderly persons, rogues and vagabonds, and incorrigible rogues. The laws relating to these categories and other V. in England were again consolidated and amended in 1822 by a temporary Act which was soon superseded by the Vagrancy Act of 1824, which, with some amendments and additions, includes the law relating to mendicancy, together with provisions concerning persons deserting or neglecting their families. This Act, in its broad essentials, remains on the statute book to-day, though frequently amended in some of its details. In the category of idle and disorderly persons it includes prostitutes behaving riotously or indecently in places of public resort; pedlars trading without a licence, persons loafing about any public place to beg alms, and others. In the category of rogues and vagabonds are included persons convicted of an offence which, if it had been the first occasion, would have constituted them idle and disorderly persons; fortune-tellers; persons obscenely exposing their persons; persons exposing wounds or

deformities to obtain alms; persons who persistently solicit in a public place for immoral purposes; persons armed with offensive weapons with intent to commit a felony; and reputed thieves or suspects frequenting various specified places with intent to commit a felony. The category of incorrigible rogues includes persons convicted a second time as rogues and vagabonds. Offenders in classes (1) and (2) may appeal to Quarter Sessions and those in class (3) from Quarter Sessions to the Court of Criminal Appeal. The penalties under the Act include imprisonment for 14 days (formerly with hard labour), or, if convicted before two justices, 3 months, or a fine. The Vagrancy Act of 1873 included in class (2) persons betting in the street or other public place. Numerous Acts dealing with the practice of palmistry and fortune-telling by gipsies were passed at different times beginning in 1530. They were superseded by the Act of 1824. The Vagrancy Act of 1935 amends the Act of 1824 so far as it relates to persons wandering abroad and lodging in barns, tents, etc., 'without visible means of subsistence.' These latter quoted words are repealed and a person so wandering and lodging will not be deemed a rogue and vagabond unless he fails to apply for, or refuses to go to, a reasonably accessible place of shelter.

**Vair, Guillaume du** (1536-1621), Fr. orator and moralist, b. in Paris. As a councillor of the parlement of Paris he pronounced his famous discourse which, though apparently an argument for the Salic Law (*q.v.*), was really an attack on the proposal of the leaguers to give the crown of France to the infant of Spain. One of the best prose writers of the period, his name has fallen into unmerited oblivion. On philosophy he wrote *Philosophies des Stoïques* and *Traité de la Sainte Philosophie*, in which he abandons the idea of secularising moral philosophy and, anticipating Pascal, urges the necessity of a return to Christian morality as the only means of defeating corruption. The works of Pierre Charron (*q.v.*) owe much to him.

**Vaishnavas**, sect of the Hindu religion, distinguished from the others by the special worship of Vishnu, who, they hold, is supreme over the other gods of the Trimurti.

**Valais** (Ger. *Wallis*), canton of Switzerland, stretching from Mt. Jura to the Col de Balme. The canton is trilingual: Fr., Ger., and It. being spoken by the inhab. It is one of the most picturesque cantons of Switzerland. There are orchards and vineyards, and deposits of limestone, marble, anthracite, lead, and iron. The canton is crossed by the Loetschberg and Simplon railways. Area 2021 sq. m. Pop. 148,300.

**Valdemar I.** (1131-82), king of Denmark, surnamed the Great, the posthumous son of Canute Lavard. He became king in 1157, and with Absalon (*q.v.*) ruled the country firmly and well.

**Valdemar II.** (1170-1241), king of Denmark, succeeded his brother, Canute VI..

in 1202. He obtained possession of Lübeck and two other equally important bishoprics, and by treaty and friendship with Frederick II., the emperor, obtained all the Wend lands and the lands of N. Germany.

**Valdemar IV.** (1320-75), king of Denmark. The guiding motive of his policy was to obtain possession of those tns. which formerly belonged to the Dan. crown and which were now scattered. By 1360 practically all the old Dan. lands, including Scania, were in his hands.

**Valdenses**, see WALDENSES.

**Valdivia**, 1. Southernmost prov. of Chile. It is richly stocked with forests, the export of various kinds of timber being a prin. industry. Area 7721 sq. m. Pop. 191,600. 2. Cap. of the above, a commercial port on the R. V., was founded in 1551 by Pedro Valdivia, the conqueror of Chile. Opposite the city is Teja Is., three m. long and over one m. wide, which contains the tanneries, shoe, and furniture factories, shipyards, flour-mills, sugar-refineries, and breweries. Pop. 19,000.

**Valdosta**, city of Georgia, U.S.A., on the Atlantic coast. It is the port for the local cotton and fruit trade. Pop. 13,500.

**Valence**, cap. of the dept. of Drôme, France, in a fertile plain, on the l. b. of the Rhone. It has a fine old cathedral, and manufs. of silk, cotton goods, gloves, leather, etc. Pop. 39,700.

**Valencia**, Duke of, see SARVAEZ, RAMON MARIA.

**Valencia**: 1. Maritime prov. and former kingdom of E. Spain. The surface is low and level along the coast, but rugged in the interior. The soil is rich, and rice, wine, oil, and mulberries are produced. Silk culture is carried on, and coal is found. Area 4239 sq. m. Pop. 1,338,000. 2. Cap. of the above, on the Guadalaviar, three m. above its mouth, the third largest tn. in Spain. V. is an anct. city, which has undergone extensive alterations. Its flourishing univ. was founded in 1410. There are manufs. of silks, velvets, linens, tobacco, leather goods, glazed pottery, and bricks, etc. Pop. 520,200. 3. Tn. of Venezuela, on the Cabriales R., 80 m. W.S.W. of Caracas, W. of Lake V. It is the cap. of the state of Carabobo. It ranks next to Caracas as a social centre and has a cathedral. There are important cotton mills, and soap and cement factories. Pop. 85,000. 4. Is. off Ireland, see VALENTIA.

**Valenciennes** (Lat. *Valentianæ*), tn. in the dept. of Nord, France. It may owe its name to the Rom. Emperor, Valentinian. V. is a fortified city of the first class, with sev. fine churches and a Jesuit college dating from the seventeenth century. It is celebrated as the bp. of Froissart and Watteau. There is a fine museum with works by Watteau, Rubens, and Antoine, and a statue of Froissart. Trade is mostly in coal, sugar, chicory, chemicals, etc. The lace to which it gives its name is no longer made here. The tn. suffered heavy damage in the Second World War. Pop. 38,700.



**Valency.** Expressed in its simplest form, the V. of an element is the number of atoms of hydrogen, or of any other standard univalent element (or radical such as  $\text{CH}_3$ ) capable of uniting with one atom of the element. The elements themselves are termed *uni-, bi-, ter-, and quadri-valent*, according to the number of univalent atoms with which they can unite. Measured by their combining capacity, elements do not always exhibit the same V. Thus one atom of phosphorus is satisfied with three atoms of hydrogen, but can combine with five atoms of chlorine. The V. of an element is therefore often a variable quantity, and, in many cases, dependent upon temp. and pressure. Thus if the compound  $\text{PH}_3$  (phosphine) be mixed with hydrochloric acid ( $\text{HCl}$ ) and the mixture subjected to pressure, a crystalline compound, phosphonium chloride ( $\text{PH}_4\text{Cl}$ ), is formed in which the phosphorus atom is *quintivalent*. Where, in a compound, an atom is not functioning in its highest recognised V., there is a tendency for the compound to unite with additional atoms to form new compounds. Thus carbon monoxide ( $\text{CO}$ ), in which the carbon (a quadrivalent element) is apparently functioning as a bivalent element, unites with an atom of oxygen to form carbon dioxide ( $\text{CO}_2$ ), where carbon exhibits its normal V. In some cases, molecules of different compounds, in which all the atoms are fully satisfied, unite to form other compounds. Thus hydrogen fluoride and potassium fluoride combine to form the compound hydrogen-potassium-fluoride ( $\text{HF} + \text{KF} = \text{KHF}_2$ ). In simple cases, the relation

$$V. = \frac{\text{Atomic Weight}}{\text{Equivalent Weight}}$$

holds good. But it is now realised that there is no hard and fast definition of V.

Werner's Theory has been especially fruitful in predicting new types of compounds. The Electronic Theory of V. appears to be firmly estab. There seem to be two kinds of V. linkage between atoms: (1) polar linkages; binding together atoms electrically opposite in character, e.g. in  $\text{NaCl}$ ; (2) non-polar links as in most organic compounds, e.g.  $\text{Cl}_2$ . The existence of such bodies as  $\text{Co}(\text{C}_2\text{N}_2)_2$  is explained by co-ordinate linkages. The whole question of V. is closely bound up with that of the structure of the atom. See also CHEMISTRY. See N. V. Sidgwick, *Electronic Theory of Valency*, 1927.

**Valens, Flavius** (A.D. 328-378), emperor of the E. During his reign, from 364, the Goths were admitted into the countries S. of the Danube. V. supported the Arians.

**Valentia**, or **Valencia**, small is. off the S.W. coast of Ireland, where there are sev. cable and signalling stations, and a small harbour. V. is important as being the site of a meteorological observatory. Pop. 1500.

**Valentine, Saint**, priest and martyr of Rome who suffered death probably during the persecution under Claudius II. in 269. St. V.'s festival falls on Feb. 14. The custom of sending valentines probably had its origin in a heathen practice connected

with the worship of Juno Februialis at the Lupercalia (*q.v.*), or perhaps in the medieval belief that birds commenced to mate on Feb. 14; its association with the saint is wholly accidental.

**'Valentine State,'** see ARIZONA.

**Valentinian**, name of three Rom. emperors: **Valentinian I.**, **Flavius** (A.D. 321-375), b. at Cibale (Pannonia) came to the throne in 364. The frontiers of the empire were exposed to great danger during his reign. Through his general, Jovinus, he gained a victory over the Alemanni in 366. In 368 the Alemanni renewed their attacks upon E. Gaul, but V. drove them back. This emperor was a man of ability and a wise administrator.

**Valentinian II.**, **Flavius** (371-392), b. at Milan, son of Valentinian I., came to the throne in 375. He was at first an Arian, but later abandoned this heresy. **Valentinian III.**, **Placidius** (419-455), son of Constantius III., was created emperor of the W. by Theodosius II., emperor of the E., in 425. Weak and vicious, he was dominated by favourites, and in 455 he was slain by Maximus.

**Valentino, Rudolph** (1895-1926), Amer. film-actor, b. at Castellana, Italy. (See under CINEMATOGRAHY.)

**Valentinus** (d. c. 160 B.C.), one of the most famous of the Christian Gnostics, b. in Egypt. He was educated at Alexandria, but went to Rome about A.D. 110. He found many adherents (*Valentinians*), especially in the E.

**Valera, Eamon de**, see DE VALERA

**Valerian**, or **Publius Licinius Valerianus**, Rom. emperor A.D. 253-60, Rom. general and faithful supporter of Gallus, after whose death he was elected emperor by the soldiers. V. took his son Gallienus as colleague, and, leaving him in charge of affairs in Europe, himself set out for the E. to crush the Persian Sapor I. (257). After some success he was entrapped by Sapor and imprisoned till his death. At first tolerant towards the Christians, he later became hostile towards them.

**Valerian** (*Valeriana*), genus of plants and shrubs with cymes of pink or white flowers. *V. miktai* (or *officinalis*), the great wild V., is a tall plant with pinnate leaves. The root is highly attractive to cats, and is used medicinally. Another variety, the small marsh V. (*V. dioica*), has tiny pink flowers and is found chiefly in marshy places.

**Valerius Flaccus**, see FLACCUS.

**Valerius Maximus**, Rom. historian of Tiberius's reign; a friend of Sextus Pompeius, whom he accompanied to the E. (A.D. 27). His *Factorum et Dictorum Memorabilium Libri IX.* is interesting as a specimen of the transition from classical to 'silver' Lat. There are eds by Hain (1865), Kempf (2nd ed. 1888), C. F. Smith (selection with Eng. notes, 1895).

**Valéry, Paul** (1871-1945), Fr. poet, b. in Cotte, of a Fr. father and an It. mother. Educated at Montpellier, he then studied law. In Paris he became one of the familiars of Stéphane Mallarmé, the symbolist, and proved himself an apt pupil. Some of his prose and verse pieces appeared in magazines, and he worked out

a scheme of what he called 'pure poetry' in which the music was far more important than the meaning. In 1917 he collected the verses he had written and they were pub. under the title *La Jeune Parque. Le Cimetière Marin* and *Album de vers anciens*, followed in 1920; his prose work, *La Soirée avec M. Teste*, also in 1920, and *Le Serpent*, in verse, 1921. In 1925 he was elected to the Fr. Academy. V. believed that poetry must produce 'enchantement'; to secure this effect, the poet must believe in the power of the word and still more in the efficacy of the sound of the word than in its significance.

V.'s famous poems *La Jeune Parque* (1917), and *Charmes* (1922, 1926), were so irresistible in their mere incantation that they were soon known by heart. No poet knew so well how to incise his verse on the careless memory of his fellow-countrymen. No Fr. poet, at the same time, could rival his ability in creating a new poetic syntax or in annexing a whole unexplored domain of sensibility. His lyricism, too, was infused into his prose. See studies by A. Thibaudet, 1923, and V. Larbaud, 1931; and F. Porché, *Paul Valéry et la poésie pure*, 1926; A. Maurois, *Introduction à la méthode de Paul Valéry*, 1933; M. Raymond, *De Baudelaire au surréalisme*, 2nd. ed. 1940, and *Paul Valéry et la tentation de l'esprit*, 1946; D. Saurat, *Modern French Literature*, 1946; and H. Mondor, *Trois discours pour Paul Valéry*, 1948.

**Valette, Valletta, or La Valetta**, cap. and seaport of Malta, on the N.E. coast, headquarters of the Brit. fleet in the Mediterranean, and an important fuelling station. Its strong fortifications were partly built by the Knights of St. John after 1530; the city being founded, 1566, between Great and Quarantine ports. It became a Brit. possession in 1801. An important port of call on the Suez route to the E., V. has considerable transit trade, and manufs. silk.

V. is a city of fine buildings but was very badly damaged in the air battles of the Second World War (see further under MALTA). The fortifications still stand and for the most part are undamaged, a tribute to the strength of the masonry of which they were constructed. See *Works of Art in Malta. Losses and survivals in the War*, H.M.S.O., 1946. Pop. 26,000.

**Valhalla**, in Norse mythology the hall (*halla*) in Asgard of the slain (*valr*) where Odin presides to receive the spirits of dead heroes. These issue forth each morning from its 540 gates to fight and return at dusk to feast, the gods acting as their hosts and the Valkyries (*q.v.*) as servants. In modern times, a tomb of illustrious soldiers, as the Pantheon near Regensburg for Germany's heroic dead.

**Valkyries** (Ger. *Walküre*), in Scandinavian mythology the awe-inspiring maidens of Odin who wing over the field of battle choosing the warriors to be slain and afterwards conducting them to Valhalla (*q.v.*).

**Valladolid**, see MORELIA.

**Valladolid**: 1. Prov. of Old Castile, Spain, including part of the Douro valley.

It is largely agric. and is called 'the granary of the Peninsula.' Fruits, cereals, wines, oil, madder, timber, honey, and wax are produced. Industries include textiles, iron-smelting, tanning, and saw-milling. Area 3155 sq. m. Pop. 332,500. 2. Cap. of the above, and formerly of all Spain, at the confluence of the Pisuerga and the Esgueva. Among its chief buildings are the cathedral (1585), municipal offices, museum, and univ. (1346). Destroyed by fire (1561), the city was rebuilt under Philip II., who was b. here. Columbus d. here (1506), and the house occupied by Cervantes (1603-06) is owned by the State. There are iron-foundries, woollen mills, paper, leather and pottery manufs, and trade in grain. Pop. 124,500.

**Vallejo**, city of Solano co., California, U.S.A., on San Pablo Bay (N.E.), 30 m. N.E. of San Francisco. It has shipyards and iron foundries, while Mare Is. opposite is the headquarters of the U.S. Pacific Naval Squadron, with a navy yard, arsenal, dry docks, and a lighthouse. Pop. 20,100.

**Valle, Pietro della, or le Pellegrino** (1586-1652) It. traveller. His journeys in the E. were described in his *Travels in India and Persia* (pub. 1658-63).

**Valley**. Just as mt. ranges and masses result from the great uplifts of the earth's crust by weathering, so great depressions exist between such uplifts. They are usually, however, too extensive to be noted except in maps; when they are sufficiently small to be a prominent feature, they are synclinal Vs. Where, too, the region between two more or less parallel faults has gradually subsided, rift Vs. are formed. Submerged rift Vs. are occupied by the Adriatic and Red Seas, many lakes being also formed in this way. Where the broken upturned strata of the earth's crust forms ranges of mts. (*q.v.*), longitudinal Vs. are formed by the more rapid denudation of the softer rocks. All these types are determined by geological changes resulting from crystal movement in the earth.

Land that is upraised from the sea would in general be slightly out of the horizontal, with very varied conditions of strata. It has often happened that surface streams, formed in the 'young' stage of the hist. of such land, flowed transversely in the strike. The eroding action of such streams is rapid enough to wear through the rocks quicker than the steady elevation, and weathering can leave them as barriers. Riv. Vs. are thus formed across the strike, and are known as transverse Vs. When quite short they are known as river-gaps. In either case they are narrow and deep, forming ravines or gorges which depend for their other features on the intensity of weathering.

Rigs and fjords are submerged or drowned Vs. Hanging Vs. are formed by trib. streams of less eroding power than the stream responsible for the main V.; they enter its sides at a level above the banks of the main stream. Rivs. flowing from regions of good precipitation and through drier regions exhibit these Vs.

**Solution Vs.** are due to gradual removal of underground material by solution due to ground water with a definite direction of seepage, or to the more defined underground streams. **Glaciated Vs.** occur in high mts. and regions of perpetual snow; they are carved by the moving ice streams, and differ from riv. Vs. in having a U-section, with steeper banks, usually rocky and precipitous.

**Vs.** are natural communications and highways, and, when extensive, the homes of civilisation. Egypt was the lower Nile valley and delta. Mesopotamia and the Tigris and Euphrates Vs. gave rise to three typical communities, Chaldea, Babylonia, and Assyria. See the bibliography under MOUNTAINS, and RIVERS.

**Valleyfield**, city of Quebec, Canada, in Beauharnois co., on the R. St. Lawrence, at the upper end of Beauharnois Canal. There are cotton, woollen, flour, paper, and saw mills, etc. Pop. 17,100.

**Vallombrosa**, Benedictine convent in Vallombrosa Valley, 16 m. E. of Florence, Italy, founded by St. John Gualbert (c. 1038). The present building dates from 1637. The abbey was suppressed and became a school of forestry after 1869. It is mentioned in Ariosto's *Orlando Furioso* and Milton's *Paradise Lost*.

**Valois, Charles de, Duke of Angoulême**, see ANGOULÊME.

**Valois, House of**, Fr. dynasty, ruling 1328-1589, and beginning with Philip VI. (1328-50). On the death of Charles VIII. without sons (1498) the crown passed to Louis of Orleans (XII.), the first of the Valois-Orleans house. This was succeeded by the Valois-Angoulême branch in 1515, the V. line finally dying out with Henry III., in 1598, when the Bourbons came to the Fr. throne. See G. Dodu, *Les Valois: Histoire d'une maison royale, 1328-1589*, 1934.

**Valona**, see VLONË.

**Valor Ecclesiasticus**, see LIBER REGIS.

**Valparaíso**: 1. Prov. of Chile, the smallest but the most thickly pop.sted. Area 1860 sq. m. Pop. 425,100. 2. Cap. of the above, and the prin. port and commercial centre on the W. coast of S. America. Copper, wheat, silver, and nitrates are amongst the exports. It lies upon a broad, open, semi-circular bay, on the slope of a spur of barren hills forming a rocky peninsula whose promontory affords good shelter from westerly and southerly storms. Costly improvements of recent times, including a sheltering mole, have made the port a more desirable haven from N. gales.

V. was captured in 1578 by Drake, and in 1596 by Hawkins, and in 1600 was sacked by van Noort. In 1866 it was bombarded by the Sp. fleet and devastated, and in 1891 was sacked by the Chileans themselves after the repulse of Balmaceda. It suffered greatly from earthquakes in 1730, 1822, 1839, 1873, while, in 1908, it was almost entirely destroyed. But the city was soon rebuilt, with architectural improvements. Not many antiquities have survived the earthquakes or other disasters (though a small part of the old colonial bn. exists in the hollow

known as 'The Port'), and the palaces, churches, villas, and fortifications are modern. Until recently all buildings were low, as a precaution against earthquakes. Of some architectural interest are the Intendencia, or headquarters of the prov. gov., the huge Naval Academy, and the Univ. of Engineering. V. has machine and railway workshops; the local products include textiles, sugar, paints, varnishes and enamels, shoes, chemicals, leather, pharmaceutical goods, and cotton-seed oil. Pop. (including suburbs), 245,000.

**Valuation**, see APPRAISEMENT, DOMESTIC BOOK, TAXATION, RATING.

**Value**, in economics, means V. in exchange. The V. of an article is expressed in terms of the article for which it exchanges, price being the V. of an article in terms of money. According to the 'Labour Theory' of V., developed and popularised by Karl Marx, all V. is the creation of labour; but the 'Cost of Production' theory widens the conception to include all the factors of production. Even so, the theory deals only with the side of supply and ignores (utility and) demand. According to the 'Marginal Theory' of V., however, which combines the two sides, exchanges tend to equate marginal cost and marginal utility. Utility is subjective; there is no truth in the view that if one party benefits from an exchange the other must lose.

**Valves**, the two parts into which the pericarp of pods splits open along defined lines to liberate the seeds.

**Valves, or Vacuum Tubes** as they are known in American countries, are the 'sine qua non' of all modern radio and electronic techniques. The very science of electronics has been built upon the development and application of V. and vacuum tubes. By their aid operations are performed at a speed and of a complexity far beyond the range of mechanical devices.

**History.** - In 1904 Fleming invented the first vacuum tube which consisted simply of a wire which could be heated electrically to incandescence and was surrounded by a metal cylinder; the whole being contained in an evacuated glass bulb with the electrical connections led out of it. He observed that when the wire or filament was lighted a current of electricity flowed from the cylinder (anode) to the filament when a positive voltage was put on the cylinder with respect to the filament. Thus the tube would pass a current from anode to filament but he found that the reverse would not take place so that he named it the 'valve'. In this early valve there were only two electrodes, the 'filament' (or cathode) and anode and for this reason it was termed a 'diode.' Three years later, in 1907, in the U.S.A. Lee de Forest added to the usefulness of the Fleming discovery by interposing a wire mesh screen or grid between the anode and cathode. He found that small changes of voltage on the grid served to control the flow of electricity through the valve and this three-electrode valve of de Forest was called a 'triode.' As time went on

further grids were added which enabled the valve to perform a number of different functions and these gave rise to the tetrode, pentode, hexode, etc. Modern developments of the early valve also include gas triodes, cathode ray tubes, camera tubes, the klystron, magnetron, travelling wave amplifier tube, accelerometer diodes, and even photo-flash tubes.

**Valve Functions and Characteristics.**—There are three basic functions which a simple valve can perform, namely, rectification, amplification, or oscillation. Before considering each function in more detail it should be remembered that V. depend for their action upon a flow of

half cycle when the anode is positive with respect to cathode; the valve being non-conducting during the other half cycle. In this manner the output is a series of D.C. pulses corresponding to the positive half cycles only. When used as a detector the output consists of D.C. pulses and is proportional to the magnitude of the alternating (A.C.) voltage at its input. It is often used as a full wave rectifier using two V. or two separate assemblies in one glass envelope so that in this way both half cycles are rectified and contribute to the final output. Figs. 1 and 2 illustrate a half and full wave rectifier respectively while Fig. 3 repre-

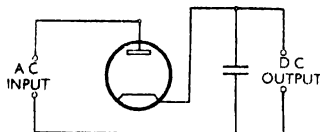


FIG. 1. BASIC HALF WAVE RECTIFIER CIRCUIT

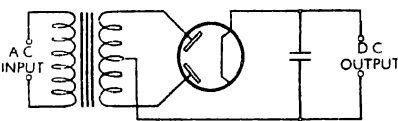


FIG. 2. FULL WAVE RECTIFIER

electrons which are particles of *negative* electricity. Having a negative charge they will always flow towards a positively charged body such as an anode and away from one having a negative charge such as a cathode. This can be confusing in the light of the older established theory that electricity flows from positive to negative but in electronic applications it is convenient to consider all movement of electricity in terms of electron flow.

Although V. can be roughly divided into basic types such as triodes, tetrodes, etc., each type is capable of modification in order to suit it to a particular function. Designers require to know the relations between the various variable factors of a particular type and it is usual to present them expressed as a series of graphs showing these different relations, i.e. the effect of varying grid voltage upon the anode current or anode voltage versus anode current for different values of grid voltage. It is useful to note much of this graph is a straight line, a most essential condition for some valve functions.

**The Valve as a rectifier.**—The early Fleming diode performed the one function of a rectifier and to-day rectifiers for radio use have a very similar electrode assembly, i.e. a filament which is sometimes surrounded by a cathode consisting of a small metal tube coated with a substance rich in electrons which is heated by the filament and surrounding the whole is the anode. The electron pass from the heated cathode to the anode only (see RECTIFIERS). A rectifier valve is used to convert alternating current to direct current (D.C.) and in a normal radio set provides the D.C. high voltage supply for the other valve anodes. In a slightly different form it can be used for the rectification of radio frequency signals and as such becomes a de-modulator or detector. When an alternating voltage is impressed on a diode, current only flows during the

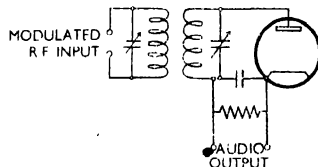


FIG. 3. BASIC DIODE DETECTOR CIRCUIT

sents the basic circuit for a radio frequency detector.

**The Valve as an Amplifier.**—The ability of the control grid of a valve to control the anode current by small changes in its voltage is the fundamental principle on which valve technique is based. If a very small variable voltage be superimposed on the fixed grid negative voltage, the anode current will vary in exact sympathy with it. These variations follow faithfully but to a more marked extent those of the grid. When the current feeding the HT to the anode flows through a fixed resistance, the current variations are turned to ones of voltage which will be many times greater than those originally fed to the grid. In this way the valve is said to have 'amplified' the grid signal voltage, which may be a radio or audio frequency one. In the former case the amplification process may be followed by detection, in the latter, the resulting output may be used to operate a loudspeaker (q.v.) or another amplifier. The process of amplification has been described using one valve but under certain conditions a pair of V. may be operated as an amplifier using the non-linear parts of the valve curve. The normal method is called class A while the latter is referred to as push-pull class AB or class B. The two last named are used when large outputs are required. A basic valve amplifier circuit is shown in Fig. 4.

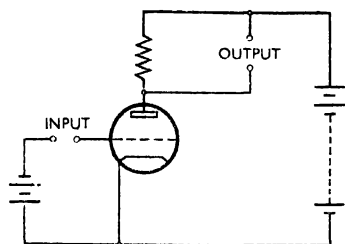


FIG. 4. BASIC VALVE AMPLIFIER CIRCUIT

**The Valve as an Oscillator.**—If a valve acting as an amplifier has some of the output voltage fed back in the correct phase to its grid a state of affairs will result in which the valve output is sufficient to sustain a continuously swinging grid voltage without the external application of voltages other than that for the heater and anode. This condition is termed 'regeneration' or 'oscillation'. This condition is used when it is required to generate either audio or radio frequency energy for purposes such as transmitters (i.e., and QUARTZ CRYSTAL). The frequency of oscillation is determined in part by the valve characteristic but largely by the electrical constants in the associated circuits. Fig. 5 shows a basic valve oscillator circuit.

**Valves in Communications.**—In the communications field the three valve functions described are the basis in one form or another of all the main operations

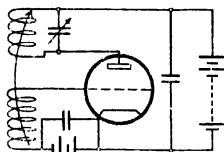


FIG. 5. BASIC VALVE OSCILLATOR CIRCUIT

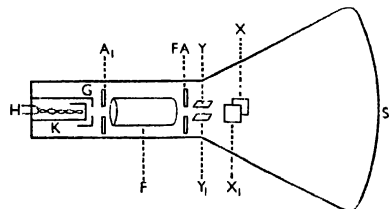


FIG. 6. ELECTRODE ARRANGEMENT OF AN ELECTROSTATIC CATHODE RAY TUBE

Large V. with heavy power handling capacity are used in transmitters (q.v.) and their smaller counterparts in receivers (q.v.). Electronics, however, use in addition numbers of special V. not falling strictly within these categories.

**The Cathode Ray Tube.**—One of the most remarkable electronic devices is the cathode ray tube (C.R.T.) used in such applications as the oscillograph (q.v.) and television (q.v.).

Fig. 6 shows diagrammatically a C.R.T. with electro-static deflection. A narrow tube is joined to a bulb of glass in the form shown. A cathode *K* is heated by the filament or heater *H* which emits a stream of electrons which are drawn from it by the cylinder *A*<sub>1</sub> called the first anode and which carries a positive voltage. To reach it they pass through a plate *G* called 'the grid' in the centre of which is a small hole sufficient to allow only a narrow stream whose intensity is dependent upon the grid voltage in the same manner as in the valve. In passing through the first anode the electrons are accelerated by virtue of its positive voltage. They next pass another cylinder *B* called the 'focusing anode' whose voltage is varied in such a way that the electrons form a narrow stream which is made to converge in a point where they impinge upon the fluorescent screen *S*. Before leaving the narrow tube and entering the enlarged bulb the electron stream passes through two pairs of parallel deflecting plates which are mutually at right angles called the *X* and *Y* plates respectively. These carry the voltage of the wave form to be studied and deflect the beam by an amount proportional to their instantaneous charge; horizontal

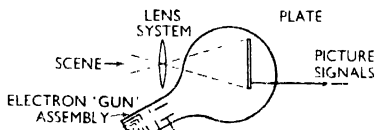


FIG. 7. SIMPLE CAMERA TUBE

deflection being caused by the *X* plates and vertical by the *Y*. Television C.R.T.s, however, are usually focused and deflected by electro-magnetic means which results in a much simpler electron gun assembly and uses focus and deflection coils which are slipped externally over the neck of the tube. (See photograph of typical receiver in the article TELEVISION.)

**The Television Camera Tube.**—A further development of the C.R.T. was used for the camera tube, the electron gun assembly together with its deflection system being almost identical. The arrangement is shown, diagrammatically, in Fig. 7. The image to be scanned is focused on the plate by optical means and is scanned by the electron stream from the gun (see TELEVISION, *Scanning for Transmission*). Modern hyper-sensitive camera tubes, such as the E.M.I. C.P.S. Emulon are very complex indeed, but their shape is substantially different, being more compact. These late versions of camera tube are able to transmit scenes successfully without the use of excessive scene lighting which was a drawback with their

earlier counterparts. C.R.Ts. vary slightly in their different applications (see TELEVISION, *Big Screen Receivers and Projection Television*).

**The Photo-electric cell.**—The photo-electric cell is a two-electrode tube whose anode current is altered in the presence of light falling upon it. It is used for control and protective circuits of all kinds and is also used for extracting the sound from film sound-track.

**The Magnetron, Klystron, and Skiatron Tubes.**—The Magnetron is a device which underwent intensive development during the Second World War and allows the generation of appreciable radio frequency power at centimetric wavelengths. For this reason it is of extreme importance in Radar (*q.v.*) applications. The Klystron is also associated with centimetric wavelengths and its power capacity is more limited than that of the Magnetron. Its main application is in the local oscillator circuits of receivers for use on such wavelengths. The Skiatron is very similar in action to the C.R.T. but, unlike the latter which produces a lighted trace on the tube screen, presents the phenomena to be examined as a dark trace on the tube face. It is thus very suitable for the display of navigational radar information.

It is to be expected that in the fast developing art of electronics new tubes will constantly make their appearance to fulfil the special needs of the engineer. Electronic equipment is finding applications to-day undreamt of ten years ago and by the aid of computing machines and instruments (see MATHEMATICS, *Electric Computation*, and MATHEMATICAL DIFFERENTIAL ANALYSER), scientists have a tool which can reduce calculations, normally taking years to complete by usual methods. In a very short space of time. The science is being made to serve all spheres of human activity from industrial processes to domestic cooking by H.F. means, and the whole art depends almost entirely on the valve and its developments. See F. E. Terman. *Radio Engineering*, 1947. and *Radio Engineer's Handbook*.

**Valves, Mechanical,** are devices for controlling the movement of fluids in pipes and conduits or their escape from containers. They may be operated by the flow or pressure of the fluid itself, by the engine of which they form a part, or independently by hand. Valves operated by the fluid at low pressure and at appreciable time intervals, as in the ordinary hand pump, may consist of a simple flap hinged at a point of the pipe wall—at the top if the pipe is horizontal—swinging out in the direction of flow and closing on to a seat against flow in the opposite direction, or the flap may be hinged on a diametrical axis as in the butterfly valve. In the case of vertical flow the poppet valve is used. Shaped like a mushroom, it rests with its flat base on the V. seating and its stem in the pipe; it lifts bodily from its seating, and some form of guide is arranged to ensure true working. To limit the lift of the valve a metal or rubber stop may be provided, or the motion may

be controlled by a suitably adjusted spring. Such Vs. are suitable for higher speeds and pressures which would rapidly throw a hinge out of action. There is, however, the difficulty of shock to be met, partly by reduction of weight of moving parts, partly by reduction of the area of contact, and partly by reduction of the lift. By providing a double seating, as in the *double-beat V.*, half the lift only is required. *Four-beat Vs.* are used for powerful engines in extension of this principle. Poppet Vs. are used in internal-combustion engines (*q.v.*) and especially in the ordinary motor-car petrol engine (*q.v.*), where they are usually operated by a cam shaft, admitting and exhausting fuel to and from the cylinder. In the Diesel engine (see OIL ENGINES) a needle valve is used for introducing the oil as a spray into the cylinder. The moving part is a tapering needle, which allows of fine adjustment. In the Pulsometer (see PUMPS) and other high-speed engines a ball is used as a V. For air pumps, Vs. of rubber are generally used. To avoid the evils of varying boiler pressure, reducing Vs. are employed. There are sev. kinds of reducing Vs., but their modes of action are the same. The entering steam passes by the V. closed by a spring to the main throttle V., which it lifts and then acts on the piston.

**Safety Valves** are attached to boilers or other vessels where the fluid contents may reach a pressure great enough to cause bursting. The *deadweight* safety V. has a spherical V. fixed to a cover piece which can be loaded with weights. These are adjusted so that the V., the shape of which prevents sticking, will lift if pressure through the pipe becomes too great. There is good stability owing to the low centre of gravity. The *lever safety V.* has a conical V., the pressure on which is adjustable by means of a weight acting at the end of a lever. The moment steam escapes, its lifting force varies in a manner differing with the shape of the V. and opening; usually the lift required to keep the passage open is greater than that required to open it, and it would be better if load diminished with opening. The use of springs intensifies this difficulty. In marine safety Vs. two or three are placed on the same V. box so as to produce more opening for the lift. Long springs are used and so adjusted that an opening of not more than  $\frac{1}{4}$  in. will be necessary, thus reducing the increased load. On locomotives springs are universal, the 'Ramsbottom' being very largely used. Both Vs. are operated simultaneously by the spring acting on the lever. The fulcrum by its position ensures the lessening of the load if the V. lifts. The extension of the lever provides a means whereby the engine-driver may test either V. for sticking or obstruction. The 'Naylor' contrivance is largely used for spring safety Vs. The V. is pressed on its seat by means of a spring acting through a bent lever so arranged that the opening of the V. and pressure on the spring alter the leverage, thus not increasing the load. The *low-water safety*

V. used on stationary engines is loaded directly by a spindle with a weight, but negatively by a weight acted on by a float through a lever. If water is too low the float increases in weight and reduces the load on the V. so that steam blows off. There are various ways of arranging that a V. shall not close until pressure is sufficiently relieved; one of the simplest is by shaping the periphery of the V. so that it forms a lip overhanging the orifice; the steam acting on this lengthens the period of lift. In steam engines (*q.v.*) the Vs. controlling admission of steam to the cylinder and exhaust are operated by the engine, as the timing is an essential factor. A number of different designs have been produced, and efficient V. gear is of prime importance for efficient working. Hand-operated Vs. are used for controlling flow in water-supply systems. See E. L. Ahrons, *Steam Engine Valves and Valve Gears*, 1921; P. Youngson, *Slide Valves and Valve Gearing*, 1927.

**Vampire**, monster which figures largely in the superstitions of Russia, Serbia, and Poland, and which, with modifications, pervades the folklore of many peoples. It is primarily the spirit of a dead man, which, leaving the grave by night, sucks the lifeblood of sleepers till they waste away and die. See also DEMONOLOGY.

**Vampire**. Brit. fighter aircraft, a de Havilland product with the de Havilland Goblin jet engine, first flew on Sept. 20, 1943. It was adopted by the R.A.F. and R.N. and by eleven other Brit. and foreign govts. The tail surfaces are carried on twin booms, and the cockpit is pressurised and armoured. The basic armament consists of four 20 mm. guns; optional external armament comprises rocket projectiles or bombs. Extra fuel tanks capable of being jettisoned, may also be fitted. A naval version, fitted with arrester hook, etc., was the first jet aircraft in the world to operate from an aircraft carrier at sea.

**Vampire Bats**, which are true blood-suckers, are found in S. America, and belong to the genus *Desmodus* of the order *Chiroptera*. They are small creatures, and suck the blood of man, cattle, and horses. The bats which are found in the genus *Amorypus* feed on fruit and insects, and have no share in the dietery of *Desmodus*.

**Vanadium**, metallic chemical element, symbol V, atomic weight 51.0, atomic number 23, found in the minerals vanadinite (lead vanadate), pucherite (bismuth vanadate), and mottramite (lead-copper vanadate). The element is prepared by heating the dichloride in a stream of pure hydrogen. It is a greyish metal with a high melting-point (about 1710° C.) and is used in making hard steels. V. forms five oxides, corresponding to the oxides of nitrogen, and three chlorides. The pentoxide, formed by burning the metal in air, gives rise to the vanadates. Many V. compounds find application in industry; thus the pentoxide is used as a catalyst in the manuf. of sulphuric acid, while ammonium vanadate is employed in dyeing leather, etc.

**Vanadium Steel**, see under IRON AND STEEL, *Vanadium*, and *High-Speed Steels*.

**Van Alslyne, Frances Jane**, see CROSSBY.

**Vanbrugh, Dame Irene and Violet**, Eng. actresses, daughters of Prebendary R. H. Barnes of Exeter. *Irene V.* (Mrs. Dion Boucicault) (1872-1949) began her stage career at the Theatre Royal, Margate, in the rôle of Phoebe in *As You Like It*. Among the numerous parts which she played may be mentioned *Rosalind* in Barrie's play of that name; *Agnes Ebb-smith* in Pinero's *The Notorious Mrs. Ebb-smith*, and *Paula* in the same dramatist's *The Second Mrs. Tanqueray*. See her autobiography *To Tell My Story* (1948).

**Violet F.** (1867-1942) also sustained a great number of rôles with high distinction, among them being *Queen Katharine* in an all-star revival of *Henry VIII.*, and *Lady Carfax* in *The Knave of Diamonds*. By the command of King Edward VII. she played *Portia* in *The Merchant of Venice*, at Windsor Castle (1905). She also appeared in films, notably in *Paganism* (1938).

**Vanbrugh, Sir John** (1661-1726), Eng. dramatist and architect, b. in London, was controller of the Board of Works from 1702. He designed *Castle Howard* (1701) and the *Haymarket Theatre* (1705), and drew the designs for *Blenheim Palace* (1705). As early as 1696, his first play, *The Relapse*, was produced; and this was followed by many others, including *The Provoked Wife* (1697), *The False Friend* (1702), and *The Confederacy* (1705). His plays are distinguished by their wit and skill of situation, and he was a master of satire, which he used with great effect against the Puritans in *The Relapse*. V. was knighted in 1714. An ed. of the *Complete Works* in 4 vols. was pub. in 1927, the dramas ed. by B. Dobree and the letters by G. Webb. See studies by C. A. Barman, 1924; and L. Whistler, 1938.

**Van Buren, Martin** (1782-1862), Amer. statesman, b. at Kinderhook, New York, U.S.A., of Dutch descent. He devoted himself from early life to law and politics, and attached himself to the Democratic party, being elected to the U.S. Senate in 1821. He opposed the establishment of the state bank, supported war with England, and advocated the raising of the tariffs and the liberal extension of the franchise. He warmly supported the candidature of General Jackson for the presidency in 1828, and became successively governor of New York state, secretary of state, and vice-president of the Union, eventually succeeding Jackson as president in 1835. The early days of his presidency were mainly occupied in setting the national finances in order, a task in which he met with only partial success owing to the opposition of Congress.

**Vancouver**, commercial metropolis of Brit. Columbia and Canada's chief Pacific seaport, on the S. shore of Burrard Inlet. It has a fine harbour, and steamships ply from it to all major world ports. W. terminus of the Canadian Pacific and Canadian National Railways, and N. terminus of the U.S. Great N. and N.

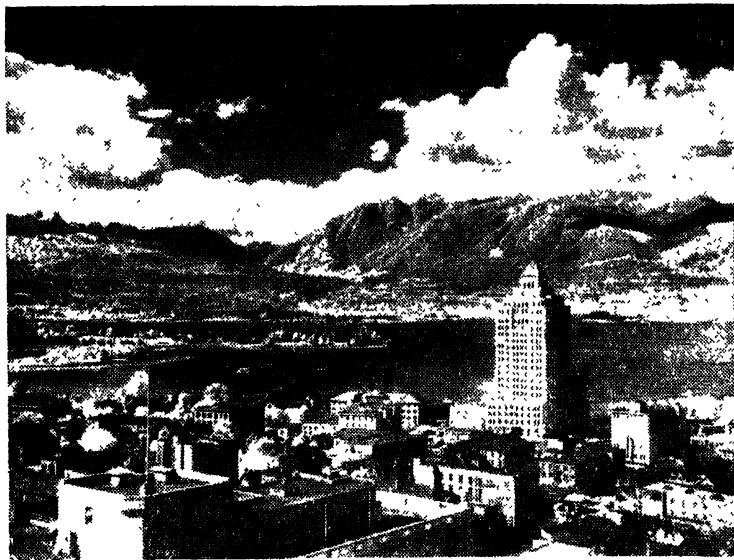
Pacific Railways, it has an airport with daily services to prin. cities in Canada and the U.S.A., and weekly services to the Orient, Australia, and N.Z. The city has many fine buildings and is the seat of the Univ. of Brit. Columbia. Chief industries: lumbering (of which it is the centre), canning, brewing, sugar refining, saw and flour milling, and shipbuilding. Pop. (1941): 275,356; with Greater Vancouver (estimated 1946), 496,000.

**Vancouver Island, Is.** off the coast of Brit. Columbia, of which it forms part. It is separated from the mainland by the straits of Juan de Fuca, Haro, Georgia, Johnstone, and by Queen Charlotte

malt, the naval station 3 in. away. Other tns. are Nanaimo, Port Alberni, Duncan, Comox, Cumborland, and Courtenay.

**Vancouver, North,** city of Brit. Columbia, Canada, opposite the city of Vancouver with which it is connected by Second Narrows Bridge. Although essentially a residential and holiday resort. It has a large lumber assembly dock, and some canning, quarrying, and shipbuilding. Pop. (1941): 8911; with dist. (estimated 1947), 21,000.

**Vandals, The,** Teutonic people of E. Germanic stock, originally inhabiting the area between the Vistula and the Oder. In the days of Aurelian (271) there was a



National Film Board, Canada

#### VANCOUVER

Looking to the north-west from the Hotel Vancouver in infra-red photograph

Sound. It was first circumnavigated by Capt. George Vancouver (1758-98), a Brit. navigator in 1792, whence its name. It was proclaimed a Crown colony in 1819 when the mainland was known as New Caledonia until created the colony of Brit. Columbia in 1858, under which name the two colonies were united in 1866. The is. is 282 m. long and has an area of 12,408 sq. m. with a deeply indented coast-line containing many deep-water harbours. The country on the S. and E. coasts is comparatively level; the interior is mountainous and heavily timbered. Gold, copper, and iron are found, and there are some important coal measures, but the chief wealth is in the forests.

Victoria (*q.v.*), the cap. of British Columbia, is on S. tip of the is., as is Esqui-

Vandal wing to the imperial army, and the famous Sticho was Vandal by descent. Under Constantine I. (330) they made a home in Pannonia, many adopting the Arian Christianity which Wulfilas had taught. About 406 they began to swarm into Gaul, across the Pyrenees to Spain, where, after much bloodshed, they settled down with the Alans in Andalusia ('Vandalitia'). At the bidding of Boniface, count of Africa, they landed on African shores (429), and having possessed themselves of Hippo (431) and Carthage (439) were soon masters of the whole prov. In 455 the Vandal leader occupied Rome and plundered the city.

The decline of the V. began after the death of Gaiseric in 477. In 534 King Gelimer, having suffered defeat at the



hands of Justinian's general Belisarius, both at Ad Decimum and Tricamarum, finally acknowledged the supremacy of Rome, and thus brought to an abrupt conclusion the independent hist. of his tribe. See J. Schmidt, *Geschichte der Vandalen*, 1901; and F. Lot, *La fin du monde antique*, 1927.

**Vandenberg, Arthur Hendrick** (b. 1884), Amer. statesman, b. at Grand Rapids, Michigan. V. had to go to work at the age of nine while still attending school, and was an office boy on the Grand Rapids *Herald*. At twenty-one he was city hall reporter and political writer; in 1906 he became publisher, manager, and editor of the paper. In 1907, however, he became a member of the Michigan state central committee and in 1928 Republican senator. In 1949 he was still senior senator. He gradually changed from a narrow nationalist approach or isolationist outlook to a strong belief in international conciliation and a modified Amer. participation in the world structure. He became the Republican Party's chief spokesman in foreign affairs. After the Second World War V. was a leading delegate to the United Nations Conference at San Francisco, the Foreign Ministers' Conference in Paris, and he worked staunchly for U.N.R.R.A. That America's foreign policy (1950) is based on bipartisan support is due largely to the influence of V. whose advice was frequently sought by the Democratic administration.

**Vanderbilt, Cornelius** (1794-1877) Amer. financier, b. at Stapleton, Staten Island. Descended from Dutch ancestors exiled by religious persecution, at sixteen he bought a boat and started a ferry, which he gradually developed into a large steamboat business round New York. In 1863 he started speculating in railways, acquiring enormous and commanding interests, and left a fortune of over \$20,000,000. By his will the Vanderbilt University was founded. His eldest son William Henry V. (1821-85) joined him in business, acquiring further extensive railway control and also left an immense fortune. See G. Meyers, *History of the Great American Families*, 1908-10, and A. D. H. Smith, *Commodore Vanderbilt*, 1927.

**Vanderdecken**, see under FLYING DUTCHMAN.

**Van der Goes, Hugo**, see GOES

**Van der Helst, Bartholomæus**, see HELST

**Van der Meer, Jan**, see MEER

**Van der Waals, Johann Diderik** (1837-1923), Dutch scientist, b. at Leiden, celebrated for his researches upon the kinetic theory of gases and upon the continuity of the gaseous and liquid states of matter. His equation

$$\mu \left( P + \frac{a}{V^2} \right) (V - b) = RT$$
 represents the actually observed relationship between the pressure, vol., and temp. of a gas much more closely than the simple law  $PV = RT$ . The constant  $b$  is, theoretically, equal to four times the real vol. of the molecules of the gas, while  $a$  is proportional to the attraction that the molecules exert upon one another.

**Van der Weyden, Rogier**, see ROGIER VAN DER WEYDEN.

**Van de Velde**, the name of three Dutch painters: *Willem the Elder* (c. 1611-93), appointed naval painter to Charles II. of England (1667); *Willem the Younger* (1633-1707), son of the above, whom he succeeded as marine painter to Charles II. (1679); *Adriaen* (1639-72), animal and landscape painter, son of the first, b. and d. at Amsterdam.

**Van Diemen, Anthony** (d. 1645), Dutch explorer and colonial governor, b. at Wulenberg. He went to India as a gov. accountant and, in 1625, became a member of the supreme council. In 1631 he returned to Holland in command of the Dutch Indian fleet, and, the following year, was sent back as director-general. Later he became governor-general, in which capacity he greatly extended Dutch interests in the Far E. In 1642 he sent Abel Tasman on a voyage to the S., the result of which was the discovery of the is. which was named after him Van Diemen's Land, but which, at the instance of its Brit. colonists, was changed to Tasmania.

**Van Diemen's Gulf**, between Coburg Peninsula and Cape Hotham and Melville Is., N.W. Australia. It is 100 m. long by 60 m. broad.

**Van Diemen's Land**, see TASMANIA.

**Vanduaar**, see PAISLEY.

**Van Dyck, Sir Anthony** (1599-1641), Flemish painter, b. at Antwerp, acquired the rudiments of his art from Van Balen. Some early religious paintings were noticed by Rubens, who made him an assistant, and V. D.'s hand can be traced in many works of that master. The earl of Arundel induced him to visit England. James I. gave him a pension, and, soon after, leave to travel to Italy where he painted many notable portraits and acquired broader æsthetic horizons in studying Titian, Veronese, and Tintoretto. He returned to Antwerp, a rival of Rubens. To this period belong the beautifully modelled etchings made from studies in 'grisaille' of famous painters and others met on his travels in Italy. Once more he visited England (1632). Knighted and made Court painter, he received the patronage of Charles I. who arranged his marriage with Mary, daughter of Sir Patrick Ruthven. Fine portraits of the Royal family come from this time, two examples being the king's head from three points of view, for the Bernini sculpture, and the large equestrian portrait of the king.

V. D. next embarked on his remarkable record of the Eng. aristocracy. These paintings are scattered throughout the land in the collections of most of the old estate families. They are not entirely by V. D., who tended to work only on the painting in the final stage, studio assistants doing the laying-in from V. D.'s careful drawing of head and body and notes on dress, decorations, ornaments, and general composition. He was always able to subtly flatter his sitter, and yet transcend his technique to produce a fine picture if seldom a true revelation of character. V. D.

owed little or nothing to Eng. tradition, but he estab. a formula for the grand style in portraiture which was to be accepted for generations. See *Lives and studies* by L. Cust, 1900; M. Rooses, 1902; E. Stokes, 1905; E. Schaeffe, 1909; and E. V. Lucas, 1926.

**Vane, Sir Henry** (the Elder, 1589-1655), Eng. statesman, studied at Brasenose College, Oxford, was knighted in 1611, and from the next year held various posts in the royal household. He entered Parliament in 1614, and was employed on various missions and commissions. In 1640 he was made a secretary of state, but he was dismissed from this and his other offices in the following year and joined the parl. party.

**Vane, Sir Henry** (the Younger, 1613-62), Eng. statesman, the eldest son of Sir Henry V. the Elder, b. probably at Debdon, near Newport, Essex. He was educated at Magdalen Hall, Oxford. After spending two years in America, where he was governor of Massachusetts (1636-37), he entered Parliament in 1640, in which year he was knighted. In 1611 he was, for his share in the impeachment of Strafford, dismissed from the treasurer-ship of the navy. He then joined the parl. party, and they appointed him to his old post, which he held until 1650. He took an active share in the negotiations with Scotland, and in 1648 was one of the commissioners who treated with Charles I. at Newport, but he refused to take part in the king's trial. In the early years of the Commonwealth he was one of the leading spirits, but in 1653 he quarrelled on a political matter with Cromwell, by whom three years later he was imprisoned for a pamphlet against the Protector's arbitrary methods. After the Restoration, he was tried for high treason and executed on Tower Hill. V. was not a regicide, but his spirited defence against the charges brought against him made the Crown decide that he was 'too dangerous to let live.' He was one of the noblest of the Eng. Puritans, and was a leading champion of religious toleration. See life by J. Willcock, 1913.

**Van Eeden, Frederik Willem van**, see EEDEN.

**Vanern**, largest lake of Sweden, 87 m. long and 44 m. broad. It is very indented, and receives sev. rivs. Its shores are high and rocky in the N., open and shallow in the S., and are fringed by sev. is.

**Vane-Tempest-Stewart, Charles Stewart Henry**, see LONDONDEBURY, MARQUESS OF.

**Van Eyck**, see EYCK.

**Van Gogh, Vincent**, see GOGH.

**'Vanguard'**, Brit. battleship, see under NAVY AND NAVIES.

**Vanilla**, genus of climbing orchids, natives of tropical Asia and America, with fleshy leaves and large white and yellow flowers. The V. of commerce is an aromatic used in the flavouring of confectionery and food. It is derived from the long dried pods of *V. planifolia*, which is extensively cultivated in tropical countries.

**'Vanity Fair'**, political and social review founded in 1868, and in its earliest

years the foremost 'society' paper of the day. The series of pencil caricatures of men of public note by Pellegrini, and, later, the chromolithographic caricatures,

itor and proprietor. Subsequent editors were O. A. Fry and Frank Harris. In 1929 the paper was incorporated in the Eng. ed. of *Harper's Bazaar*. In 1950 V. F. resumed pub. as a separate jour., designed to appeal to 'the younger, smarter woman, with the emphasis on fashion, good fiction, travel, etc.' It is pub. by the National Magazine Company.

**Van Leeuwenhoek, Anthony**, see LEE-UWENHOEK.

**Van Lennep, Jacob**, see LENNEP.

**Van Lerberghe, Charles** (1861-1907), Belgian poet writing in Fr., b. at Ghent. He was educated at the famous Collège de Sainte Barbe in Ghent. He won a large measure of fame with his best book, *La Chanson d'Ève* (1904). His poetry is sensitive and beautiful, but the mystical symbolism makes much of its thought difficult to follow.

**Van Marnix, Philip de Sainte Aldegonde**, (1538-98), Dutch patriot and Protestant reformer; he studied theology at Geneva. As mayor of Antwerp (1584-85), he defended the city against Alexander, Duke of Parma, and played a leading part in the liberation of the Netherlands.

**Van Meegeren, Henricus Antonius (Han)** (1889-1947), Dutch painter and forger, b. at Deventer. He made eight fakes of seventeenth century masters, including 'Christ at Emmaus,' a supposed Vermeer.

**Vannerol**, see BANDEROLE.

**Vannes**, seaport and cap. of the dept. of Morbihan in Brittany, France, with shipbuilding works and manufs. of woollens and ropes. As Veneti it was the cap. of the Celts. Pop. 28,200.

**Vannig**, see MAN, ISLE OF.

**Vannucci**, see PERUGINO.

**Van't Hoff, Jakobus Hendrikus** (1852-1911), Dutch chemist, b. at Rotterdam; studied anatomy, chem., and mineralogy in Holland, France, and Germany, and in 1878 was appointed prof. of chem. at Amsterdam. In 1896 he became prof. to the Academy of Sciences at Berlin. His great work was in connection with stereo-chemistry. Taking up the discoveries of Willibronus in connection with the lactic acids, he enunciated in 1874 his discovery that 'in carbon compounds which exhibit the property of rotating the polarised ray in either direction, the molecule in every case contains at least one atom of carbon combined in four different ways' (Tilden), and, later, taking up Kekulé's doctrine of the linking of atoms, he worked it out with great success. In 1894 he pub. a paper which threw much light on the perplexed subject of solutions in electro-chemistry. In 1901 he received the Nobel Prize for chem. See E. Cohen, *Jacobus Henricus van't Hoff: Sein Leben und Wirken*, 1912.

**Van Tromp**, see TROMP.

**Van Veen, Maerten**, see HEEMSKERK, MAARTEN JACOBSZ.

**Vanzetti, Sacco and, Case of.** One of the most famous cases in the court annals of the U.S.A., grew out of the murder, on April 15, 1920, of the paymaster at a guard of a shoe-factory at S. Braintree, Massachusetts, and the theft of the money. In May, two It. immigrants, Nicola Sacco, a shoemaker, and Bartolomeo Vanzetti, a fish-peddler, were arrested and charged with the crime. On May 31, 1921, they were tried by Judge Webster Thayer and a jury and on July 14 were found guilty.

At that time there was a widespread intolerance of radical political opinions, and it was claimed by the defence that the accused did not have a fair trial owing to this feeling. Motion for a new trial was based upon the claim that the identification of the men was not complete. This was refused, as were other motions for new trials. In Nov. 1925 an It. under sentence for another murder confessed that he had participated in the Braintree crime and exonerated Sacco and Vanzetti. Judge Thayer refused a new trial, alleging that the confession had been made solely that the criminal might delay his own execution. An appeal to the State Supreme Court failed, it being held that the trial judge had the final power to determine a matter of retrial. On April 9, 1927, Judge Thayer sentenced the men to the electric chair. A great outcry arose, not only in the U.S.A., but throughout the world. It was deemed shocking that one judge should pass upon all the facts and motions in the case, with no review by a higher court. Finally, a despairing appeal was made to Governor Fuller, who promised to review the papers in the case. At the same time he named President Lowell of Harvard Univ., President Stratton of the Massachusetts Institute of Technology, and Robert Grant to make an independent investigation. Both the governor and the committee found no ground for retrial or clemency and the men were executed, Aug. 23, 1927, protesting their innocence to the last. There still remains in the minds of many lawyers a grave fear that there was a miscarriage of justice. See O. K. Fraenkel, *The Sacco-Vanzetti Case*, 1932.

**Vapinicum**, see GAP.

**Vaporisation**, see EVAPORATION.

**Vapour**, see GAS AND GASES.

**Var:** 1. Riv. of S. France, rising in the Alpes Maritimes and flowing into the Mediterranean at Nice. Length, 84 m. 2. Dept. in the S.E. of France, bounded by the depts. of Bouches-du-Rhône, Basses-Alpes, and Alpes Maritimes. It is a mountainous and wine-producing region; silk, paper, and soap are manufactured; marble, salt, lead, and iron are found. There are valuable fisheries of tunny, sardine, and anchovy. There are two arrons., Draguignan (the cap.) and Toulon. Area 2333 sq. m. Pop. 370,600.

**Varahran**, see BAHRAM.

**Varder**, see AXIUS.

**Varenus, Bernhardus** (or Bornhardus), see GEOGRAPHY, *Exploration and Cartography*.

**Varese:** 1. It. prov. in Lombardy. It

is intensively cultivated, has manufs. of iron, silk, and cotton, and a considerable tourist traffic. Area 462 sq. m. Pop. 450,200. 2. Cap. of the above, 10 m. E. of Lake Maggiore. There is a fine museum, once the ducal palace. There are manufs. of silk, machinery, automobiles, shoes, and wine. Pop. 54,300.

**Variable Stars.** Many thousands of stars exist whose luminosity is variable; such stars are called V. S. The different characters of the variations led E. C. Pickering to group them into five classes according to their periods and features of variation. These are: (1) Eclipsing variables; (2) Cepheid variables; (3) Long-period variables; (4) Irregular variables; (5) Novae or temporary stars. Eclipsing variables (sometimes known as eclipsing binary stars) differ from the other classes by the fact that they are not intrinsically variable in brightness. Their variations are caused by the mutual eclipses of the binaries, one component passing between the other and the earth, thus cutting off some of the light from the other, the amount of which depends on the inclination of their orbital plane to the line of sight of terrestrial observers. The best known instance of this class is Algol which consists of a bright and a comparatively dark star revolving around their common centre of gravity in 2 days 21 hours. Cepheid variables are generally regular in period of variation and also in their light-curve, and have periods between a few hours and about 50 days. For further information see STRAUSS. Long-period variables include those stars whose periods range from about 2 months to 2 years or more, the greatest frequency occurring near the period of 300 days. The variation extends over sev. magnitudes and in the case of  $\alpha$  Cygni exceeds eight magnitudes. These stars generally belong to the M.N.R.S spectral types and the most famous of this class is  $\alpha$  Ceti or Mira (*q.v.*). Sev. theories have been advanced to explain the causes of stellar variability, but these are open to various objections. The fact that many stars contract and expand rhythmically under the force of gravity in the first case and under increasing temp. in the second case, suggests that an explanation may be found here, but there are difficulties in accepting this as a final explanation. Irregular Variables have a narrow range of variation—seldom more than half a magnitude and often less than this—and their behaviour is more or less unpredictable. The percentage of such variables increases with increasing redness of the stars. Betelgeuse is the brightest star among the irregular variables and it is known that this star varies considerably in its diameter, but it has not been decided whether such pulsations keep in step with variations in brightness. Even if this were proved it would not necessarily follow that variations in the Cepheids were due to the same cause. Other well-known irregular variables are R Corone Borealis and U Geminorum, the former remaining uniformly bright for a long time and then becoming much more faint, returning

after a period which cannot be predicted to its normal condition. This star is typical of many others which behave in a similar manner. Others resemble U Geminorum in which the light remains practically the same for a long time but at intervals increases rapidly and afterwards fades more slowly. It is remarkable that while the R Coronae Borealis stars tend to congregate in the neighbourhood of the Milky Way the U Geminorum stars show no preference for this region. Novæ or temporary stars rise quite suddenly and unexpectedly from obscurity or invisibility and appear in many cases as bright stars. Not all novæ become visible to the naked eye; many are so far away that they are discovered only by the photographic plate. Those that become visible to the naked eye are usually responsible for a considerable amount of public interest which is short lived because they often fade away rapidly and often become invisible in the course of a few months or even less. See NOVÆ.

**Variation, Calculus of.** Just as the differential and integral calculus deals with the law of fixed curves, the C. of V. traces a curve in its variations of form. The introduction was due to J. Bernoulli (1696) who propounded the problem: To find the path of shortest time traversed by a point M in falling freely under the influence of gravity from a point A to another B situated in a vertical plane. For this purpose it is necessary to consider not merely the change in  $y$  due to a variation in a single variable  $x$ , but the further variation due to a change in relation between a number of variables with which  $y$  is connected by some law. The problem always resolves itself into that of finding a number of functions satisfying the given conditions and from these to find the integral involving them and one or more of their differential coefficients, this integral to be a maximum or a minimum. An elementary example of the use of the C. of V. is in the proof that the maximum volume enclosed by a given surface is a sphere. The C. of V. in its modern developments has proved to be of great practical use to physicists in kinetic pinetates, relativity, and quantum theories. See I. Todhunter, *On the Calculus of Variation*, 1871, G. A. Bliss, *The Calculus of Variations*, 1925; and A. R. Forsyth, *Calculus of Variations*, 1947.

**Variation, in biology.** It is a matter of common observation that offspring differ to a certain extent from their parents. Such V. in plants and animals is of the greatest importance, since it provides the means whereby evolution has taken place; without V. evolution is clearly impossible. Vs. are of two main kinds, *fluctuations*, which are small and continuous Vs. in size, colour, shape, and the like, as for instance gradations in the height of man, and *mutations* or sports, which are larger Vs. such as those seen in the Manx cat, the Shirley poppy, the fastigiated Yew, and numerous mutations of the Evening Primrose (*Oenothera*) first described by de Vries. C. Darwin relied chiefly on fluctuations as providing the raw material

for evolution, but the modern tendency is to regard mutations as more important, since they are definitely inherited. The cause of mutations must lie in some disturbance of the chromosomes, as for example in a multiplication in their number, a phenomenon known as *polyploidy*. Mutation can be induced artificially, by such means as radium, X-rays, and the plant derivative colchicine, but its causes in nature are largely unknown. See also CHROMOSOMES, EVOLUTION, EUGENICS, HEREDITY.

**Variations.** One of the important musical forms, the principle of which is the statement of a theme followed by varied treatments of it, sometimes with a restatement of the theme in its first form at the end (e.g., Bach's *Goldberg V.*), sometimes with a more elaborate final section, such as a fugue (e.g., Beethoven's *Eroica V.* for piano).

**Varicose Veins**, condition in which the veins are enlarged, being increased in length as well as in girth. The valves of the veins are incompetent and allow the blood to leak past them in a direction away from the heart. They are found in the lower part of the body, affecting the lower leg and thigh, causing hæmorrhoids or piles in the rectum if the rectum be involved, and varicocele when the spermatic cord is affected. They are caused by occupations involving a great deal of standing, constriction such as that caused by tight garters, or pregnancy; they may be associated with general debility or a hereditary tendency. The best treatment for V. V. in the legs is the wearing of an elastic bandage, and as much rest as possible with the legs horizontal or elevated. Varicocele is rarely troublesome; if it causes real distress, the excision of the dilated veins will cure the disease. Recently the method of internal coagulation by a number of injections of salicylic acid or other substances has been practised with considerable success, in some cases the V. V. withering almost to the point of disappearance. Radical treatment consists of ligaturing the vein at both ends and removing it completely. V. V. tend to become worse if left untreated. They may rupture and become ulcerated. A mottled appearance of the legs is a less serious condition caused by enlargement of superficial veins when the legs are placed regularly too near a fire.

**Variola**, see SMALLPOX.

**Varius, Rufus Lucius**, Rom. poet of the first century B.C. Varius was his patron, and he was a friend of Horace and Virgil, becoming a literary executor of the latter (19 B.C.). His tragedy *Thyestes* was highly valued, and he also wrote epics. Only fragments are extant.

**Varley, Cornelius** (1781-1873), Eng. water-colour painter, younger brother of John V. (q.v.), b. in London. He exhibited occasionally in the Royal Academy, and is noted as the inventor of the graphic telescope. His works consist chiefly of carefully finished classical and architectural subjects, and also some figures.

**Varley, John** (1778-1842), Eng. water-

colour painter, *b.* at Hackney in London, but spent many years amid the picturesque and inspiring scenery of N. Wales. He exhibited in the Royal Academy.

**Varna** (anct. *Odessos* or *Tiberiopolis*), fort. tn. of Bulgaria, on W. shore of the Black Sea, chief port between Kustendje and the Bosphorus. Meat, grain, cloth, dairy produce, leather, etc., are largely exported. The Turks defeated the Hungarians in a battle here (1444). It was the headquarters of the Allies in the Crimean War. V. was ceded to Bulgaria by the Treaty of Berlin, 1878, and here was the summer palace of the former kings of Bulgaria. Pop. 69,900.

**Varnhagen von Ense, Karl August** (1785-1858). Ger. author, *b.* at Düsseldorf. In 1814 he married Rahel Antonie Friederike, originally called Levin, afterwards Robert. She was a christianised Jewess and a remarkably cultured woman, who gathered round her the chief men of letters and savants of her day. V. is chiefly famous as a biographer; among his works are *Musculmanach; Goethe in den Zeugnissen der Mitlebenden* (1823); *Biographische Denkmale* (1824-30). His correspondence with Carlyle and with his wife has been pub. See study by C. Misch, 1925; and a life of Rahel by L. Feist, 1927.

**Varnish** consists generally of a solution of resin in a solvent such as linseed oil or alcohol. The non-volatile drying oils (e.g. linseed oil) are natural Vs., and are usually boiled before use. Spirit Vs. are those in which the resinous material (copal, amber, etc.) is dissolved in a solvent such as alcohol or benzole. After application the solvent dies away and leaves a thin coating of the resin which is apt to crack. Oil Vs. have the non-volatile drying oils as solvents. The oil does not evaporate but remains in the V., giving a toughness to the resinous film. See JAPANING; LACQUER AND LACQUERING.

**Varnishing of Paintings**, see RESTORATION (OF PAINTINGS).

**Varnish Tree**, evergreen tree, *Aleurpes cordate*, of the family *Aria carduaceae*. It flourishes in China and the E. Indies; its timber is one of sev. kinds known as lignum vitae. It owes its name to the lac in its seeds, a resinous secretion exuded by certain insects.

**Varro, Gaius Terentius**, Rom. consul and soldier. Of low birth and demagogic opinions, he was chosen, despite the opposition of the aristocracy, to bring the war against Hannibal to an end. His colleague, Paulus, was one of the leaders of the aristocratic party. The two consuls were defeated by Hannibal at the historic battle of Cannae (*q.v.*, and also ROMAN HISTORY), which was fought by V. against the advice of Paulus. V. was one of the few who escaped and was subsequently made responsible for the disaster, in which 70,000 Romans, including Paulus, were killed.

**Varro, Marcus Terentius** (116-28 B.C.), Rom. soldier and writer, *b.* in Roate, of Sabine descent, studied under the grammarian L. Atilius Stilo and in Athens under the philosopher Antiochus of Ascalon.

He fought for Pompey in the civil war, and reached the praetorship after serving in the offices of tribune of the people, quaestor, and curule aedile. After the battle of Pharsalia V. was treated with clemency by Caesar who made him his librarian. However, V. was proscribed by the second triumvirate (43-26 B.C.) and harshly treated by the dictator, Antony. Ultimately, he was left in peace for the last fifteen years of his life to pursue the literary labours patronised by Caesar. V. was a most prolific writer. In the sphere of belles lettres he wrote, especially, numerous satires after Menippus (*Satiræ Menippæ*), poems and mock tragedies, orations and funeral eulogies, much of these being the work of earlier years. His *Imagines* consisted of hundreds of prose biographies of Gk. and Rom. celebrities with a metrical *eulogium* for each. On hist. and antiquities his outstanding work was the *Antiquities*. He is also credited with a number of technical treatises on philosophy, grammar, law, and philology. To the present day the antiquarian researches of V. form the foundations on which rests much modern knowledge of the earlier Rom. hist., especially constitutional, and of the social life of Rome.

**Varuna** (*cf.* Gk. *Οὐρανός*), anct. Vedic god of day; also the god of water.

**Vasa**, see VAASA.

**Vasa, Gustavus**, see GUSTAVUS.

**Vasari, Giorgio** (1511-74), It. historian of art, *b.* at Arezzo. During his lifetime he was famous as a painter and architect but it is now recognised that his paintings lack inspiration. He is chiefly remembered as an art historian. There is critical merit besides trustworthy fact in his celebrated *Lives of the most eminent Painters, Sculptors, and Architects* (1550) an Eng. trans. has been reprinted in the Everyman's Library (1927). It was partly rewritten and enlarged in 1568, and contains his autobiography. See W. Kallab, *Vasari-Studien*, 1908.

**Vasco da Gama**, see GAMA, VASCO DA.

**Vascular System** (Lat. *vasculum*, a little vessel), of animals. This is the system of tubes, present in most animals, and conveying blood to and from different parts of the body. See further under CIRCULATION OF THE BLOOD, *Comparative*; HEART.

**Vascular System**, of plants, is a series of cells and vessels conducting sap from the roots to the leaves, and the soluble products of photosynthesis from the leaves to various parts of the plant. In the higher plants, the vascular tissue consists of wood or xylem and bast or phloem, but in the lower plants, such as the mosses and liverwort, there are merely conducting strands of thicker walled cells. In stems (*q.v.*) the xylem and phloem masses are collateral; in roots (*q.v.*), they alternate. They may be arranged in separate vascular bundles as in the Phanerogams (*q.v.*) or in concentric cylinders, the phloem being outermost, as in many Ferns (*q.v.*). As girth increases, more vascular tissue may be formed by the activity of the cambium (*q.v.*) in secondary growth.

See J. A. Thomson, *Outlines of Zoology*, 1929.

**Vase**, from Lat. *vas*, vessel, a vessel to contain things, generally of an ornamental character though in antiquity most often for practical use, commonly of circular section and taller than it is wide. It may be made of clay or contain clay in its fabric (earthenware, stoneware, or porcelain), or of glass or metal. *Vs.* vary greatly in form and use, and in time range from prehistory to the present day. They form a large part of the ceramic art of many countries, and especially of China, Japan, Greece, and certain countries of Europe. Thus the study of *Vs.* as such would include a consideration of wares as far apart in time and technique as those of protohistoric Gk. pottery, Chelsea porcelain, and Wedgwood. See also under POTTERY.

**Vaseline**, term coined by Robert A. Chesebrough about 1870 and used by Chesebrough Manufacturing Company. Consolidated, as its registered trade mark upon the company's line of products, the chief of which is petroleum jelly, which is a semi-solid mixture of hydrocarbons, distilled from petroleum and purified, and used largely as an unguent, lubricant, etc.

**Vassal**, see under FEUDALISM.

**Västerås**, or **Vesterås**, cap. of the co. of Västmanland, Sweden. It is an old tn., with a cathedral and an episcopal library. Pop. 49,000.

**Västerbotten**, or **Vesterbotten**, co. of Sweden, between Norway and the Gulf of Bothnia. Lumbering is important. Cap. Umeå. Area 22,839 sq. m. Pop. 229,800.

**Västernorrland**, or **Vesternorrland**, co. of Sweden, between Jämtland and the Gulf of Bothnia. Lumbering is important and there are exports of wood pulp. Cap. Härnösand. Area 9925 sq. m. Pop. 279,300.

**Västmanland**, or **Vestmanland**, co. of Sweden, between Uppsala and Örebro. Iron and silver are mined, and iron goods and pig iron produced. Cap., Västerås. Area 2611 sq. m. Pop. 190,400.

**Vatter**, lake of Sweden, connected with the Baltic Sea and Lake Vänern by means of the Göta Canal. 75 m. long, and just over 10 m. wide, its picturesque shores and clear limpid waters make it one of the most beautiful lakes in Sweden. It is dotted with is., one of the chief being Väsingsö.

**Vatican**, **The**, residence of the popes since their return from Avignon in 1377. Previously the home of the popes had been the Lateran, but they had long possessed a palace on the Vatican hill next to St. Peter's. In 1377 the Lateran palace was in ruins, and Pope Gregory XII. decided to make the V. his permanent residence. Subsequent building has made it a vast collection of edifices, containing over 4000 rooms, used mainly for museums or administrative purposes. The residential part is relatively small. Among its artistically famous units are the chapel of San Lorenzo (built under Nicholas V., d. 1455), the Appartamento

Borgia (built under Alexander VI., d. 1503), the world famous Sistine Chapel (built under Sixtus IV., d. 1473), containing the masterpieces of Michelangelo ('The Last Judgment') and the 'Creation'), Botticelli, and Ghirlandajo, and the Loggia of Julius II. (d. 1513). The actual residence of the Pope is of later date, being built under Sixtus V. (d. 1590), and Clement VIII. (d. 1605). Adjoining the palace are the Museums, five in number, containing the finest collection of Greco-Rom. sculpture in existence, and including Egyptian and Etruscan depts. In the Pinacotheca and elsewhere are the choicest works of Raphael, Perugino, Domenichino, and Titian. The grand corridor of the V. library is the longest room in the world, being a fifth of a m. in length. The V. is also an institute of scientific research for which its archives (35,000 vols. and 120,000 letters, documents, etc.), and its library (upwards of 356,000 vols. and 60,000 documents), make it the most important centre for historical research in the world. There is also a V. observatory, the Polyglot Press, and the Galleria Lapidaria, containing 6000 stone inscriptions.

The V. is also the administrative centre of the Rom. Catholic Church. Here are held conclaves for the election of the pope, consistories for the creation of cardinals, and here a number of the Rom. congregations (i.e., depts. for the administration of Church affairs) hold their meetings. In particular, the cardinal secretary of state, *i.e.*, the cardinal in charge of foreign policy, has his offices in the V. The ensemble of buildings covers an area of 1151 ft. by 767 ft., and represents one of the most historic architectural records of the world. The policing of the V. is mainly in the hands of the famous Swiss Guards, formed by Julius II. in 1505.

**Vatican City**, area adjacent to S. Peter's, being the independent state governed by the Pope, and the smallest state in the world (108 ac.). It lies almost entirely N. and W. of the basilica of S. Peter and is bounded by the Piazza di San Pietro, the Via di Porta Angelica and the Via di Leone IV. on the E., the Viale Vaticano with very high walls completes the enclosure on the other sides. The pop., *i.e.*, those having permanent residence in the Vatican, is about 600. The V. C. has its own governor, post office (with stamps), coinage, lawcourts, and railway train, connecting with the It. station of S. Pietro in Trastevere. Cavour had tried to settle the Rom. question but had failed; negotiations begun in 1926, ended in the signing of the Lateran treaty between Cardinal Gasparri and Mussolini on Feb. 11, 1929, by which the Papal states were renounced by Pope Pius XI. and Città del Vaticano (V. City) came into being. Its neutrality was violated by the Gers. in 1943, when they occupied it with paratroops. See also VATICAN and CHURCH, STATES OF THE.

**Vatican Council**, last ecumenical Council of the Rom. Catholic Church, 1870. It is principally famous for the promulgation

of the doctrine of papal infallibility. The Council opened on Dec. 8th, 1869, with about 600 members present. A considerable number of the bishops considered such a definition inopportune, but the majority favoured it, and finally, on the 18th July, 1870, 433 out of 435 persons present voted for the definition. In England Newman and Acton, who had considered it inopportune, submitted afterwards. In Germany Dollinger rejected it and founded the denomination known as the Old Catholics. The Council also promulgated an important constitution on the relationship between faith and reason. See C. Butler, *The Vatican Council*, 1925.

**Vauban, Sébastien le Prestre de** (1633-1707), marshal of France, and military engineer, *b.* at St. Léger. He served under Condé in Spain, and, in 1658, he was France's chief engineer under Turanne. In 1678 he became 'commissaire-général des fortifications' and proceeded to strengthen the frontier defences, building the fortresses of Landau and New Breisach, etc., and rebuilding Strasbourg (1681). But besides constructing or improving over 150 strongholds, he conducted forty sieges, including those of Lille (1662), Maastricht (1673), Cambrai (1677), Ghent (1678), Namur (1692), and Old Breisach (1703). Made a marshal of France in 1703, his latter days were darkened by royal displeasure and neglect. See also FORTIFICATION. See lives by E. Halévy (Eng. trans., 1924); and P. Lazard, 1934.

**Vaulouse**, dept. of S.E. France, is divided into two regions: the valley of the Rhône, which consists of plains and level country; the other mountainous and including the chains of the Lure and the Lubéron. The climate of V. is healthy and mild, except in the seasons when the mistral ravages the country. One of the prin. cultivations of the dept. is madder, and silk culture is carried on. Wheat and other cereals, vegetables, olives, and fruit are also grown. V. furnishes good wines, notably those of Sorgues. There are three arrons: Avignon, Carpentras, and Apt. The cap. is Avignon. Area 1381 sq. m. Pop. 249,800.

**Vaud** (Ger. *Waadt*), canton of S.W. Switzerland. The canton is in the shape of a triangle, the base of which extends along one of the shores of Lake Geneva. The chain of the Jura Mts. cuts through it in a S.W. to N.E. direction. The ter. of V. was owned successively by the Fr., the emperors of Germany, the dukes of Zaebringen, and the house of Savoy. It did not become an independent canton until 1798, and entered the Confederation in 1803. V. is the most prominent vine-growing canton in Switzerland. Wine, herbs, tobacco, clocks, and condensed milk are among the chief objects of industry or export. Salt is mined in Bex dist. Cap. Lausanne. Area 1238 sq. m. Pop. 343,300.

**Vaudeville**, play in which dialogue is interspersed with songs. The word is a corruption of Vaux de Vire, the name of two valleys in Normandy. In the fif-

teenth century one Olivier Basselin, of Vire, composed a number of drinking songs, which spread over France, bearing the name of their native place. V. in the U.S.A. has practically the same implications as variety in Great Britain.

**Vaudois**, see WALDENSES.

**Vaughan, Henry** (1622-95), Welsh poet, *b.* in Llansaintffraid, Brecknock, and, as a native of the land of the anct. Silures, called himself 'Silurist.' Educated at Oxford and London, he settled as a physician at Brecon, and Newton-by-Usk. He seems to have served in the Royalist forces, though no exact details are known. His first book, *Poems, with the Tenth Satire of Juvenal Englished*, appeared in 1646. *Olor Iscanus (The Swan of Usk)*, a collection of poems and trans. was surreptitiously pub. in 1651. About this time he had a serious illness which led to deep spiritual impressions, and thereafter his writings were almost entirely religious. *Silic Scandillans: Sacred Poems and Private Exclamations* (1650), his best known work, consists of short poems full of deep religious feeling. V. is an unequal poet, and even at his best not so careful an artist as George Herbert, but also at his best he is the more imaginative poet, if with less of tender fancy. His *Complete Works* were ed. by A. B. Grosart, 1871, and *Poems* by E. K. Chambers, 1896. See E. Blunden, *On the Poems of Henry Vaughan*, 1927; Elizabeth Holmes, *Vaughan and the Hermetic Philosophy*, 1932; and F. E. Hutchinson, *Henry Vaughan: A Life and Interpretation*, 1941.

**Vaughan, Herbert Alfred** (1832-1903), Eng. cardinal, *b.* at Gloucester. He was first educated at Stonyhurst, thence went to a Jesuit school at Brugelotte, Belgium, and afterwards to Rome in 1851 to study for the priesthood. At Manning's suggestion, V. was chosen to succeed Dr. Turner as Bishop of Salford in July 1872. On the death of Manning in Jan. 1892, he was appointed Archbishop of Westminster, and enthroned at the pro-cathedral, Kensington, on May 8. The following year he received a cardinal's hat from the hands of Leo XIII. He founded St. Joseph's College for foreign missions at Md. Hall. In July 1894, V. started his great project for erecting a cathedral at Westminster, which he lived just long enough to see consummated. See life by J. G. Shead-Cox, 1910.

**Vaughan Williams, Ralph** (b. 1872), Eng. composer, *b.* at Down Ampney, and educated at Charterhouse and Trinity College, Cambridge. The formation of his peculiarly individual style of composition is partly due to the influence of Eng. folk-song and old Eng. music to the time of Purcell. He has done valuable work in collecting folk-songs, chiefly in E. Anglia and Herefordshire. His first success was his setting of Whitman's *Toward the Unknown Region* (1907). *The Sea Symphony* was produced in 1910, the *London Symphony* in 1914, and the *Pastoral Symphony*, one of his greatest achievements, in 1922.

His choral and orchestral works have

achieved considerable popularity, among the most notable being *Benedicite, Sancta Civitas, Magnificat, Domus Nobis Pacem* (1936), and *Five Tudor Portraits* (1936), and some consider these to be his highest achievement. Among his songs, his early *Linden Lea* is a popular favourite. Both his songs and chamber music show a characteristic delicacy; while his operas, notably *Hugh the Drover* (1924), *Sir John in Love* (1929), and *The Poisoned Kiss* (1936), exhibit the more vigorous side of his composition. His works are characterised by strong melodic invention and an original fund of contrapuntal resource in which there is nothing reminiscent of scholasticism. His influence on the work of sev. Eng. composers has been considerable. He received O.M. in 1935. *Hypocrite, National Music* (1935). See study by A. E. Dickinson, 1928; and F. Howes, *The Dramatic Works of Ralph Vaughan Williams*, 1937.

**Vault**, arched covering to a building, formed of brick, masonry, or other strong material. The chief varieties of Vs. are the barrel, the groin, and the various types of Gothic. Besides these there is the dome, which is usually considered separately. The barrel V. is the earliest form, and was in use among the Egyptians in the fourth millennium B. C. It is almost always of semicircular cross-section. The groin V. is formed from the intersection of two barrel Vs., and so can only be used above a square area. By the addition of ribs at the groins there arose the Romanesque vaulting, which later gave way to the pointed Gothic ribbed Vs. of which specimens are common throughout the country. See ARCHITECTURE.

**Vauvenargues, Luc de Clapiers, Marquis de** (1715-47). Fr. writer and moralist *b.* at Aix-en-Provence. The bulk of his work is small, but its merits are very considerable. His interest lies in the social institutions of man, and the play and development of human forces. The *Œuvres complètes de Vauvenargues* were pub. by C. de Saint-Maurice in 1821; a new ed. by D. L. Gilbert in 1874; and a selection ed. by G. de Champris, in 1912. See F. Lee, *La Bruyère and Vauvenargues*, 1903, and a study by F. Viel, 1938.

**Vauquelin, Louis Nicolas** (1763-1829) Fr. analytical chemist, *b.* at Saint-Andre, Normandy. He obtained an introduction to Fourcroy (*q.r.*) and was then able to devote his time to chemical analysis. V. held various posts, including those of prof. of chemistry at the Collège de France, commissioner on the pharmacy laws, and eventually succeeded Fourcroy on the faculty of medicine at Paris (1809). He discovered chromium, glucina (beryllium), and with P. J. Robiquet, asparagine. He is also known as the discoverer of quinic acid and other naturally occurring compounds; he also conducted valuable researches in lactic acid, alum, and naphtha.

Vaux, Vicomte de Melun et de, *see*  
FOUQUET, NICHOLAS.

**Vauxhall**, dist. of London in the bor. of Lambeth, once famous for its gardens.

which were opened in 1660 (see *Vanity Fair* by Thackeray, and Pepys's *Diary*) and closed in 1859.

**Vector and Vector Analysis**, an outcome of the theory of quaternions (*q.v.*), of which it may be said to be a simple application to many problems in practical mechanics and physics, enabling more rapid conclusions to be obtained by simplified processes. A **V.** is a geometrical quantity which is related to a definite direction in space; magnitude, direction, and sense are required specifications. If two Vs. are placed so that the beginning of the second coincides with the end of the first, then the **V.** from the beginning of the first to the end of the second is the sum of the Vs. A similar process applies to any number of Vs., and the theory is followed up on general mathematical lines. A simple geometrical application will serve as an illustration. To prove that the three medians *AL*, *BM*, *CN* of a triangle *ABC* intersect in a point which divides each of the medians in the ratio 1 to 2. Draw a triangle *ABC* (it will be more convenient to take *B* as the vertex), and let *L*, *M*, *N* be the middle points of *BC*, *CA*, *AB* respectively. Let the lines *AL*, *CN* meet in *O*; then the line *BM* will pass through *O*. *Proof.* Join the point *B* to the points *O* and *M*, and *O* to *M*, but no assumption is made that *BO**M* is a straight line. Let *OA* = *a*, *LO* = *t* *a*, *OC* = *u*, *NO* = *t* *u*. Then *BA* = *N* *a* + *O* *a* = *t* *u* + *a*, *BL* = *LC* = *LO* + *OC* = *t* *a* + *u* + *u*, *BO* = *B* *u* + *NO* = *t* *u* + *a* + *t* *u* = *a* + 2 *t* *u*; also *BO* = *BL* + *LO* = *t* *a* + *u* + *t* *a* = 2 *t* *a* + *u*. Hence *t* *a* + *u* = 2 *t* *a* + *u*. Now by a well-known principle if *ma* + *nr* = *pa* + *qr*, *m* = *p*, and *n* = *q*, and hence *2t* = *q*, *u* = *r*, or *t* =  $\frac{1}{2}$ . Again *B* *a* + *2t* *a* = *BC*, or 2 *B* *a* + 2 *t* *a* = *BC*, or 2 *B* *a* + 2 *t* *a* = *BL* + *LO* + *LO* + *OC* = *BL* + *BM* = *BL* + *BN* =  $\frac{1}{2}$  *a* + *u* + *u* =  $\frac{1}{2}$  *a* + *u*. But *BM* = *B* *a* + *t* *a* =  $\frac{1}{2}$  *a* + *u*, and hence, since *BO* = *a* + *u*, *BM* and *BO* are in the same straight line, and also *BM* =  $\frac{1}{2}$  *BO*, or *M* *O* =  $\frac{1}{2}$  *OB*. It has been shown that *NO* =  $\frac{1}{2}$  *NC*, and that *LO* =  $\frac{1}{2}$  *LC*, or *O* *L* =  $\frac{1}{2}$  *LC*, and hence the medians are all divided at *O* in the ratio 1 to 2. In this example the Gk. letters represent Vs., and it will be noticed they are used directly and not with reference to coordinates. The **V.** product (*a* *b*) of two Vs. *a* and *b* is a **V.** perpendicular to both, its length represents to scale the area of the parallelogram generated by moving the second **V.** along the first, and the area is taken in the sense of the first **V.** The scalar product (*a* *b*) of two Vs. *OA*, *OB*, is the area of the rectangle contained by *a* and the projection of *b* on it, and is a scalar. The former is often represented *ab* sin  $\theta$ , the latter *ab* cos  $\theta$ ; where *a* and *b* denote the lengths of *a* and *b*,  $\theta$  the included angle, and *e* a unit vector perpendicular to the plane *BOA*. In the electromagnetic theory of radiation the method is now chiefly used. See **E. B.**



Wilson, *Vector Analysis: text book founded upon the lectures of J. W. Gibbs*, 1901-02; and C. E. Weatherburn, *Vector Analysis* (elementary), 1921; (advanced) 1924.

**Veda and Vedism.** Veda is the general term for the anct. sacred literature of India, and Vedism is the early Aryan religion of India. The religious literature of India opens with four collections of hymns meant to be used at sacrifices. These are the Vedas proper, and the oldest of them is the *Rigveda* which contains the poems from which the earliest information about the Aryans in India is derived. The other collections (*Samhitas*) of sacrificial hymns (*Mantras*) are the *Samaveda* consisting of liturgical songs; the *Jajurveda* consisting of sacrificial formula; and the *Atharvaveda*; the last consists for the most part of charms and incantations, and is the prin. source of knowledge of the popular beliefs and superstitions of anct. India. See also SANSKRIT LANGUAGE AND LITERATURE.

**Vedanta, Uttara-Mimamsa, or Upanishad**, system of Brahmanic philosophy which in its main features carries on the speculations of the older Upanishads; e.g. God is the sole real existence. He is both Creator and Nature, and all things are resolved in Him; the individual soul proceeds from Him and ultimately returns to Him; it is not a free agent, but is ruled by God, and its sufferings depend upon its bodily organs. See A. B. Keith, *The Religion and Philosophy of the Veda and Upanishads*, 1926; W. S. Urquhart, *The Vedanta and Modern Thought*, 1928; N. Macnicol (ed.), *Hindu Scriptures* (Everyman's Library), 1938; and C. Isherwood (ed.), *Vedanta for the Western World*, 1948.

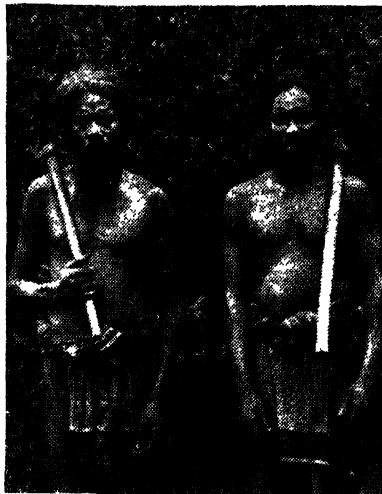
**V.E.-Day**, May 8, 1945, on which was celebrated the defeat of Germany in the Second World War, unconditional surrender having been signed at Rheims on the previous day. 'V' painted on walls, tapped out in Morse, and symbolised in the rhythm of the opening bars of Beethoven's fifth symphony, had been adopted as a symbol of resistance to, and victory over, the Gers.; 'E' stood for Europe.

**Veddahs** (or **Veddahs**), meaning 'hunters' are regarded as the true aborigines of Ceylon and the last remnant of a race descended from the Yakkas (or Yakkos), a race of hunters whose ancestry dates back to the stone-age, and who were probably immigrants, well over 2000 years ago from pre-Dravidian India. Although the census of some years ago estimated the number of V. living in Ceylon at nearly 5000 they are fast dying out.

There are three types of V. in Ceylon, forming three distinct social groups, each composed of sev. clans. They are: (1) *The Wild or Rock Veddahs*. These dwell in caves or under shelter of overhanging rocks and forest trees in remote vils. (2) *The Coast Veddahs*. These live in the sea-board vils. between Batticaloa and Trincomalee, dwelling in mud-huts. (3) *The Village Veddahs*. These are intermediate between (1) and (2), and scattered over small areas in the neighbourhood of

the Sinhalese and Tamils in the E. Uva and N.-Central Provs.

As a rule, the V. are about 5 ft. tall, and can be distinguished by their dark, swarthy skin, long, black, shaggy hair, narrow skull, slightly-prominent cheek bones, and other features. Their lan-



S. V. O. Somanaer

#### ROCK VEDDAHs

guage consists of a limited range of guttural sounds, and though it is not quite comprehensible to the Sinhalese, it is supposed to be of Aryan origin. Some of the V., however, can speak Sinhalese or Tamil, or an admixture of both. Their religion is a sort of demon-worship.

So merged is the Veddah tribe with the other races surrounding them that most of them are really half-V. at the present day.

**Veen, Maerten van**, see HEEMSKERK, MAERTEN JACOBZ.

**Vega** (α-Lyræ) was the pole star of the twelfth and thirteenth millenniums B.C., and will attain the same position in the fifteenth and sixteenth A.D. Huggins attempted to photograph its spectrum in 1863, and Draper succeeded in 1872. Its spectrum belongs to that class of A stars, which are white stars, like Sirius, in which the spectral lines of hydrogen reach their greatest strength. The temp. of V. is about 11,000° C., and it is approaching the sun at about 10 m. per sec. Its magnitude is 10.14, parallax 0.124 m., and distance 26 light-years.

**Vega Carpio, Lope Felix de (Lope de Vega)** (1562-1625), Sp. poet and dramatist, b. in Madrid. He took part in the expedition to the Azores in 1582, and also served in the Armada in 1588. He was secretary to the duke of Alva and the

marquis of Malpica, and in 1613 took holy orders.

V. C. was held in high estimation in his own day, and his influence in Spain was as great as that of Voltaire in France. He was a voluminous writer, producing epics, pastorals, odes, sonnets, and novels, but it is to his dramatic works that he owes his eminent place in literary hist. and of these he wrote some 490. Some of the best known are: *Los Ramilletes de Madrid*; *La Boba para los Otros y Discreta para si*; *El Perro del Hortelano*; *La Viuda de Valencia*; *El Maestro de Danzar*; *Las Flores de Don Juan*; *Desprecio agridorado*; *Estrella de Sevilla*; *Esclava de su Galán*; *Premio del bien Nablár*; *Alcade de Talamca*. Among his other works are the *Angelica*, an epic poem written in imitation of the *Orlando Furioso*; the *Arcadia*, a pastoral romance; and *Dragoneta*, an epic poem concerned with the hist. and death of Drake.

His plays were pub. in 25 vols. in 1604-47, and his miscellaneous works in 21 vols. in 1776-9. See lives by H. A. Rennert and A. Castro, 1919, and J. de Entrambasaguas, 1912; also J. F. Kelly, *Lope de Vega and the Spanish Drama*, 1902; R. Schevill, *The Dramatic Art of Lope de Vega*, 1918; K. Vossler, *Lope de Vega und sein Zeitalter*, 1932; and J. de Entrambasaguas, *Estudios sobre Lope de Vega*, 1916.

**Vega, Garcilaso de la**, see GARCILASO DE LA VEGA.

**Vegetable Butters**, see BUTTERS.

**Vegetable Marrow**, fruit of an annual trailing gourd (*Cucurbita Pepo ovifera*) much grown in cottage and other gardens for use as a vegetable and for making preserves.

**Vegetable Physiology**, see PLANT.

**Vegetable Sponge**, see LOOFAN.

**Vegetarianism**, see under FOOD AND FEEDING.

**Veglia**, or **Krk**, is. in the Adriatic, Yugoslavia, 8 m. S.E. of Fiume. Livestock and marble are produced, and fishing carried on. The cap., V., is on the W. coast. The is. is 12 m. wide and 23 m. long.

**Vehmgericht**, see FEHMIC COURTS.

**Veii**, anc. city of Etruria, some 10 m. N.N.W. of Rome, and lying on a plateau near Isola Farnese. Until it was razed to the ground by Camillus after ten years' siege (396 B.C.), it was a formidable rival to Rome.

**Veiled Prophet**, see AL-HAKIM-IBN-OTTO.

**Veins**, in anatomy, the blood vessels that carry the blood from the tissues to the heart. Like arteries, they are composed of three coats, *tunica adventitia*, *tunica media*, and *tunica intima*, but in general there is less muscular and elastic tissue. The V. are generally divided into three systems: the *general venous system*, the *pulmonary system*, and the *hepatic portal system*. The general venous system returns the blood from the greater part of the organism to the heart. The pulmonary system brings back the oxygenated blood from the lungs to the left ventricle of the heart. The hepatic portal system carries the blood from the stomach, intestines, spleen, and pancreas

to the liver by the portal V., ramifying into numerous capillaries. The pulmonary and hepatic portal V. have no valves.

**Veins**, in geology, see DYKES.

**Veins, Varicose**, see VARICOSE.

**Velasquez, Diego Rodriguez de Silva y** (1599-1660). Sp. painter, b. at Seville, learnt the rudiments of his art in the studios of Francisco Herrera and Francisco Pacheco, whose daughter Juana he married. From the day when Olivarez, King Philip IV.'s favourite, summoned him to Madrid, his life was a series of successes, till finally (in 1651) he was awarded the office of 'Aposentador del Rey,' or court marshal to King Philip. His first visit to Italy and Rome, covered the period 1629-31. He was intimate with Rubens and Ribera, and was chosen before the other court painters to commemorate 'The Expulsion of the Moors' from Spain (1629). Though he applied his master-hand to landscape, and to religious, classical, and historic painting, it was in portraiture that his genius and technique were both displayed at their highest. Thus, though high praise is due to his 'The Surrender of Breda,' ('Las Lanzas,' see SPAIN, History), to his 'Bacchus,' to his 'Christ on the Cross,' and to 'The Water-Carriers,' it is his numerous portraits of Philip IV., of Count Olivarez, and of 'The Maids of Honour' ('Las Membradas'), etc., which have won for V. his proudest eminence. His 'Christ in the House of Martha,' and his only important nude 'Venus and Cupid' ('the Rokeby Venus') are in the National Gallery. Other fine works are at Apsley House and in the Wallace Collection. The Phaidon Press pub. a complete ed. of his drawings and paintings in 1944. Murillo, Juan de Pareja, and Juan del Mazo were his pupils. See lives and studies by R. A. M. Stevenson, 1895; W. Armstrong, 1896; H. Stokes, 1901; R. Davies, 1914; E. V. Lucas, 1924; and E. Harris, 1939; and C. Justi, *Velasquez und sein Jahrhundert* (4th ed.), 1933. See also the monograph *Velasquez in the Collection of the Hispanic Society of America*, 1925.

**Velathri**, see VOLATERRÆ.

**Veldt**, large stretch of grassland of the great plateau of S. Africa, lying to the W. of the Drakensberg Mts. It consists of widely scattered farms and vils, and a few large tns. The farms are worked by natives, cattle and sheep-raising being the chief occupation. Maize is also grown in large quantities.

**Velez de Guevara**, see GUEVARA, LUIS VELEZ DE.

**Veliki Luki**: 1. Region of the R.S.F. S.R., bordering on the Latvian S.S.R. 2. Cap. of the above, 132 m. S.E. of Pskov on the Lovat R., in the twelfth century part of the Novgorod republic. In the Second World War the Gers. converted the tn. into a 'hedgehog' defence point, and there was most bitter fighting before it was retaken, on Jan. 1, 1943. Products include leather, footwear, and candles.

**Veliki Novgorod**, see NOVGOROD.

**Velites**, see under ROMAN ARMY.

**Velleius Paterculus**, see PATERCULUS.

**Velletri**, tn. in Italy; formerly belonged

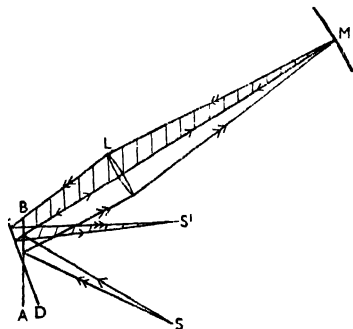
to the papal states. There is a municipal palace, and the gardens of the Lancelotti Palace are famed for their beauty. In the Second World War the town, a bastion of the 'Rome line,' was very badly damaged. Pop. 34,500.

**Vellum**, see MANUSCRIPTS and PARCHMENT.

**Velocipede**, see CYCLES and CYCLING.

**Velocity**, rate of displacement of a moving point. It is sometimes applied to the rate at which a change of state or configuration may take place in bodies. To specify *V.* completely, the direction as well as the rate at which the body is moving must be given, and hence it is a vector quantity. To determine the *V.* of a body, the distance passed over by the body is divided by the time it takes. This gives the average *V.* over that distance. If the *V.* is not uniform the instantaneous *V.* is required, which necessitates the use of the differential calculus. The unit of *V.* is defined as that *V.* with which a moving point passes over unit distance in unit time, e.g. ft. per sec., cm. per sec.

**Velocity of Light.** Light travels through empty space at the rate of 186,271 m. per second, while its speed in air is only slightly less than this. The journey from the sun to the earth, a distance of approximately 93 million m., occupies a ray of light for almost 500 seconds; in 1 second the light traverses a distance rather more than seven times round the equator. The interest of the student of physics in the determination of the *V.* of *L.* is threefold: in the first place the experimental determination of the *V.* of *L.* in air and in water provided a direct refutation of Newton's corpuscular theory of light; in the second place Maxwell discovered theoretically that electromagnetic waves travel through the ether with a velocity equal to that of light, and therefore identified electromagnetic waves and light waves.



But the real philosophical importance of the *V.* of *L.* is due to the development of the Theory of Relativity (*q.v.*) which establishes the *V.* of *L.* in a vacuum as the greatest possible speed in nature, a speed that is an absolute constant; the *V.* of *L.* relative to all observers is the same.

Two methods of measuring the *V.* of *L.* are especially interesting, viz. (i) Römer's determination in 1675; (ii) Michelson's (*q.v.*) determination in 1926; the former is the first determination ever made; the latter, much more accurate, giving the result of 299,796 kilometres per second.

**Römer's Method.**—The planet Jupiter has sev. moons, and as they revolve around it they sometimes pass behind it, as seen from the earth, so that they are eclipsed. The time of an eclipse for any moon can be deduced by astronomical calculations. Reference to the figure on p. 439 of Volume Eight shows that if the eclipse of a moon occurs when the earth is at *E*, i.e. when Jupiter is in opposition to the sun, this 'light-signal' sent out from Jupiter will reach the earth earlier than in the case where the earth is at *E'*, Jupiter being then in conjunction. Römer, by his observations, deduced the time taken for a light-signal to travel the distance *EE'*, which is the diameter of the earth's orbit, a distance of 196,000,000 m. The result he obtained was 286,000 kilometres per second.

**Michelson's Method** is really an improvement on the methods of Fizeau and Foucault. The idea, may be understood from the apparatus he used in 1882. A beam of light from a source *S* (diagram) falls on a rapidly rotating prism while it is in the position *AB*. The light is focused by a convex lens on the surface of a concave mirror *M*, whose centre of curvature is at the centre of the lens. The beam of light is therefore reflected as shown (the shaded beam) and it reaches the rotating prism, now at *CD*; it is reflected there and forms an image at *S'*. In this attempt the distance *LM* was about 2000 ft., while a turbine drove the prism at the rate of 256 revolutions per second. By measuring *SS'*, the *V.* of *L.* can be deduced from the other data. In 1926, a few years before his death, Michelson made his final determination referred to above. The distance between the fixed mirror and the rotating prism was actually 22 m., the former being erected at Mount San Antonio, the latter at the Mount Wilson Observatory. This enormous increase in the 'run' for the light was achieved by the design of a perfectly fashioned octagonal mirror, so that the image found was far brighter than when Michelson used a single mirror. Moreover, by adjusting the speed of rotation of the prism, Michelson arranged that the light set off on its 44 m. journey from one face of the prism and was received on its return by the succeeding face in exactly the same position occupied by its predecessor when the light set out. Thus the image *S'* was made to coincide with *S* and an inconvenient measurement was eliminated. See also MICHELSON-MORLEY EXPERIMENT.

**Velour** (Fr. velvet), fabric with a weft of mohair yarn, and linen and double cotton warps, used for hats and upholstery. It resembles felt, but has a pile akin to that of plush or velvet.

**Velsen**, tn. in the prov. of N. Holland, Netherlands port of Amsterdam. It

manufs. chemicals, paper, and iron, and there is shipbuilding. Pop. 47,900.

**Velvet** (Lat. *villosa* and Fr. *velours*), fabric believed to have originated in the E., possibly in China. Its surface is a short thick pile, produced by weaving a second set of warp threads over the already woven cloth, these threads being passed over wires and cut before the wires are removed. V. is made of pure silk, a similar material with a cotton back and silk face being termed velveteen.

**Venaissin**, see COMPAT VENAÏSSIN.

**Vendace**, see under CORÉGONUS.

**Vendée**, La, maritime dept. of W. France, comprising three divisions, viz. Bocage (woodland), Côte (plain), and Marais (marsh). The first-named occupies the greater portion of the dept. Agriculture is the chief industry, and wheat the most important crop, sheep and cattle are reared in the S. The prin. tns are La Roche-sur-Yon and Sables d'Olonne, and Poitiers and Maillezais are of historical interest. The wars of the V. were counter-revolutionary risings of 1793. Area 2690 sq. m. Pop. 393,700.

**Vendémiaire** (Lat. *vindemia*, vintage), name applied to the first month of the year in the Republican calendar during the Fr. Revolution, extending from Sept. 22 to Oct. 24.

**Vendetta**, modern survival of the primitive custom of blood feud or mode of self-redress by which fellow-kinsmen were bound to take vengeance for any personal injury done to a member of their clan or family. The V. is narrower than the old blood feud in that vengeance is exacted only in the single case of a murdered relative. The V. exists or did exist until recently in Corsica and in parts of Sicily and Sicily. See also BLOOD AVENGER OF.

**Vendôme, Antoine de Bourbon**, Duke of, see ANTOINE.

**Vendôme, Louis Joseph** (1654-1712), marshal of France, b. in Paris, son of Louis, second duke of V., and great-grandson of Henry IV. He first saw service in the Dutch campaign of 1672, and in the war of the Grand Alliance served with distinction at Steinkirk and Marsaglia. In 1702 he was placed in command of the Franco-Sp. army in Italy, fighting two indecisive battles against Prince Eugene and overthrowing the Austrians at Calcinato (1706). He was defeated by Marlborough at Oudenarde in 1708. In the Sp. campaign of 1710 he won his last victories. See life by the Marquis de Ségur, 1913.

**Vendôme**, tn. in the dept. of Loir-et-Cher, France. It was formerly the cap. of a co., which was afterwards raised to a duchy, and the dukes resided in its anc. castle. Manufs. include woollen and cotton goods, leather, gloves, and paper. Pop. 10,300.

**Vendors and Purchasers.** The law concerning contracts for the sale of land, and especially their specific enforcement in the Chancery Courts (as to which see SPECIFIC PERFORMANCE), is commonly referred to as the law of V. and P.; though, of course, personal property can equally form the

subject of such a contract. Contracts for the sale of interests in land are, however, of such intricacy and so hedged round with technicalities (though to a less degree since the passing of the Law of Property Act, 1925), that it is always desirable in negotiating for sale or purchase to employ legal experts. (As to the form of such a contract, see under CONTRACT; and FRAUDS, STATUTE OF.) No contract for the sale of land will stand unless: (1) It is quite clear what the subject-matter of the contract is. In this connection if the subject-matter can be ascertained, mere uncertainty as to the exact measurements will not of necessity invalidate the contract. (2) The price is fixed. A contract for sale 'at a fair valuation' is enforceable; but if the mode of valuation be specified in the contract the court will not decree specific performance until the price has been ascertained by the means so specified. (3) All other essential terms are included. All the court requires is that the agreement contains the necessary terms upon which to base a formal conveyance; hence the omission of trifling details is immaterial. Where it is contracted to sell in addition to land (*q.v.*) the goodwill (*q.v.*) of a business, it is essential to specify the time for completion of the sale. The duties of a vendor are: (1) To show and make a good title to the land in accordance with the contract. The 'abstract of title' (*i.e.* the hist. of the title showing the successive steps in its transfer) must go beyond thirty years where necessary to arrive at a root of title, *i.e.* a point at which it can properly begin. The best root of title is a mortgage or purchase deed, as such a document leads to the inference that at the time of the execution thereof the title must have been investigated and in the case of a purchase deed the scisin (*q.v.*) of the possessor in title is shown. A general devise by will or a disentailing deed is not a proper root of title. (2) To enter into covenants with the purchaser. The most important are: (a) that he has a right to convey the land; (b) that the purchaser shall have quiet enjoyment of the land; (c) that the land is free from encumbrances; (d) that he will make all 'further assurances' (*i.e.* conveyances) that may be necessary; and in the case of sale of leasehold (e) that the lease is valid and the rent paid. (3) To execute a proper deed of conveyance (*q.v.*) on the payment of the purchase money. It is for the vendor to bear the cost of supplying a proper abstract of title, and he must also bear the expense of getting in all outstanding estates (*q.v.*) (including outstanding legal estates) and paying off encumbrances and stamping all title-deeds. In the absence of express provision to the contrary the purchaser prepares and pays for the preparation of the deed of conveyance, though the vendor pays the cost of *perusal*. (4) To deliver to the purchaser all title-deeds in his possession or control. The duties of the purchaser are: (1) To peruse the abstract of title and make all his objections to it in reasonable time; (2) to prepare the deed of conveyance and deliver

it to the vendor for execution; (3) on completion to pay the purchase money, or, if a deposit has been paid (as is usual by way of guarantee of good faith), the residue of the purchase money, together with any interest due for delay; and (4) to enter into possession of the land so as to relieve the vendor from any further liability incident to ownership. Breach of contract by the purchaser entitles the vendor either (1) to bring an action for specific performance and join with the claim a claim for damages (*q.v.*); or (2) to sue at common law for the price; or (3) to take out a summons (a summary remedy available only to decide questions as to title); or (4) to sue at common law for damages; or (5) to enforce his lien (*q.v.*); or (6) to resell and recover any difference in price from the purchaser; or (7) to sue for rescission. The purchaser has remedies corresponding to (1), (3), and (4) above; he may also sue (1) for rescission of the contract, adding a claim for the return of any purchase money paid; (2) to enforce his lien by claiming a declaration of his right thereto and an order for sale.

The law of V. and P. was considerably changed by the Law of Property Act, 1925, which came into force on Jan. 1, 1926. This Act introduced a new system of making titles to land (*see CONVEYANCING*) and, generally, revolutionised the law of real property, though many of the topics or branches of the law of V. and P., *e.g.* the contract of sale, specific performance (*q.v.*), etc., are not materially affected. The underlying principle of the new system, in relation to V. and P., is to extend the doctrine of 'purchase for value without notice,' or, in other words, to keep the equities off the legal estate. The Act of 1925 provides a method by which the vendor can prove a legal title to the legal estate alone and the purchaser is protected from equitable interests even if he has notice. Where a conveyance of the legal estate to a purchaser is made, the purchaser will take the land free from equitable interests even if he has notice of them, in the following cases: (1) if the land is sold by a tenant-for-life or otherwise under the powers of a settlement (*q.v.*) the purchaser takes free from all the equitable interests of persons entitled under the settlement, but not from such equitable interests as restrictive covenants and equitable easements which existed prior to the settlement, (2) if the land is sold by trustees under a trust for sale, the purchaser takes free from all equitable interests of persons entitled to the proceeds under the document creating the trust and, if the trustees are appointed by the court or are a trust corporation (*see TRUSTS AND TRUSTEES*), the purchaser takes free from interests having priority to the trust for sale; but not from certain other interests, if he has notice of them, *viz.* interests protected by a deposit of deeds, restrictive covenants, easements, contracts to sell legal estate, etc.; (3) if the land is sold by a mortgagor, the purchaser takes free from the equity of redemption; (4) if the land is sold by a

personal representative of a deceased owner, the purchaser takes free from the claims of persons interested in the estate of the deceased; and (5) if the land is sold under order of the court, the purchaser takes free from the interests of all persons who are parties to the action. It is to be noted that the Act of 1925 does not give the purchaser protection against equitable charges, etc., protected by deposit of the title deeds of the legal estate; nor against any interest of a person in land of which he is in actual possession. *See* H. Scabornie, *Law of Vendors and Purchasers of Real and Leasehold Property* (9th ed.), 1926 (supplement), 1929; J. H. Dart, *Vendors and Purchasers* (2 vols., 8th ed.), 1929; T. C. Williams, *Contract of Sale of Land*, 1930; T. C. Williams and J. M. Lightwood, *Vendor and Purchaser of Real Estate and Chattels Real* (2 vols., 4th ed.), 1936; Sir C. Brickdale and Sir J. S. Stewart-Wallace, *Land Registration Act, 1925* (4th ed.), 1939; E. O. Walford, *Conditions of Sale of Land*, 1940; Sir L. H. Elphinstone, *Covenants Affecting Land*, 1946; and A. Gibson, *Conveyancing* (16th ed.), 1917.

**Veneering**, gluing of a thin sheet or sheets of ornamental wood over a foundation of inferior wood. V. is much practised in furniture making, and is the most popular and least expensive means of forming a decorative surface on plywood (*q.v.*) boarding. In good V., only the best plywood is employed, since the final polished surface would show any minor defects that cheaper plywood might possess. The best results are obtained when the veneers are of double thickness. A good straight-grained veneer is laid on the outer ply of the board with the grain at right angles to the grain of the ply, and the finishing figured veneer is then laid on this with its grain following the grain of the outer lamination of the ply board. Counter veneers, of similar substance and strength to the veneers laid on the face, are laid on the back of the ply to prevent the whole from being pulled out of its true plane.

**Vener, Lake**, *see* VÄNERN.

**Venereal Diseases** (from Lat. *Venus*, *Veneris*, the Goddess of Love), nowadays frequently abbreviated to V. D.; is so called because these diseases are usually acquired during sexual intercourse. Such a mode of infection is probably invariable in the case of *gonorrhœa* (*q.v.*) of adults, but a child can become infected in the eyes from the genital passage of the mother during birth. *Syphilis* (*q.v.*) is occasionally transmitted by other means, *e.g.* by kissing, or by a blood transfusion from an infected person; it can also be acquired by the fetus (unborn child) in *utero*, but it is not strictly speaking inherited. These two, which are the only V. D. of importance in Gt. Britain, are dealt with in separate articles, though it may be added here that the treatment of gonorrhœa, and to a certain extent of syphilis also, has been improved and shortened by the use of penicillin. In the Second World War, as always during wartime, the incidence

of V. D. increased, and a publicity campaign was undertaken by the gov. to warn the public of the dangers. Regulation 33B. (1939) prescribed that any person named as a source of contact of V. D. by two patients should be compelled to attend for treatment; lectures and prophylactic treatment were given in the armed forces. There are arguments both for and against the inclusion of V. D. in the list of notifiable diseases. Notification is compulsory in some countries (e.g. all forty-eight states of the U.S.A.), but not in Great Britain. See L. and R. E. Wilcoxon, *A Textbook of Venereal Diseases*, 1950.

**Venesection**, or **Phlebotomy**, cutting of a vein in order to let blood. V., together with other methods, such as cupping and leeching, was the chief remedial measure of medieval physicians. The underlying idea was the elimination of the morbid 'humours' causing disease. In modern practice it is employed in conditions where the blood-pressure needs to be reduced.

**Venetia**, see **VANNES**.

**Veneti**, anct. race who occupied Cisalpine Gaul in N. Italy, around the delta of the Po. They made alliances with Rome to protect themselves from Celtic invaders. On the conquest of the Cisalpine Gauls, the V. likewise became included under the Rom. dominion. Many of their cities were plundered by the Huns under Attila (c. A.D. 450), and the remaining inhab. took refuge on islets off the coast, out of which Venice has since grown.

**Venetia (Venezia)**, old ter. div. of N. Italy, lying between the Alps and the Adriatic and extending from the frontier of Austrian Carinthia and Istria in the N.E. to the Lower Po and Lombardy in the S.W. After the First World War, which brought a considerable increase of ter. to Italy at the expense of Austria, V. was divided into three regions: Venetia Proper or Veneto (q.v.), corresponding to the older div.; V. (Venezia) Tridentina and Venetia Giulia (Venezia Giulia). The modern dept. of V. Tridentina, with an area of 5250 sq. m., and pop. in 1947 of 706,000, comprises the provs. of Bolzano and Trento. Up to the Second World War the prov. of V. Julia and Zara (Venezia Giulia e Zara) comprised the provs. of Fiume, Gorizia, Pola, Trieste, and Zara, with a combined area of 3456 sq. m. and a pop. in 1943 of 1,030,000. But the peace treaty with Italy, signed in Paris on Feb. 10, 1947, stipulated the cession to Yugoslavia of the greater part of Venezia Giulia together with the commune of Zara. The region of Friuli-Venezia Giulia now consists of the provs. of Gorizia and Udine with a pop. in 1947 of 938,300.

**Veneto**, or **Venetia Proper**, region of Italy corresponding to the older ter. div. of Venetia or Venezia. Its prov. are Belluno, Padua, Rovigo, Treviso, Venice, Verona, and Vicenza. The physical features of the dept. vary very much in character. On the Adriatic side of the Po, the Tagliamento and smaller rivs. end in a delta which extends all along the

coast and is subject to inundations. N. of the Po is a fertile region at the foot of the mts., which latter are by no means arid. To the eastward are the Carnic and Julian Alps with widespread and fertile foothills and the isolated Euganean hills, of volcanic origin, near Padua. Marble is quarried, especially near Verona. Agric. products include the chief cereals, rice, beans, wines, tobacco, sugar-beet, potatoes, etc. The industries include woollen manufs., especially in Vicenza prov., cotton textiles, silks, glass, beet sugar, laces, strawplait, and hemp, and there are iron foundries, sawmills, and shipbuilding yards. Silk culture flourishes extensively here, as in Lombardy and Piedmont. There is a large hydro-electric plant on the Piave. Pop. (1947) 3,945,000.

**Venezia**, see **VENICE**.

**Venezuela (Estados Unidos de Venezuela)**, S. Amer. republic occupying the whole of the lower basin of the R. Orinoco and the coastal plain surrounding the Gulf of Maracaibo, with a sea coast just within the Caribbean Sea and therefore facing the E. Indian Is. E. of Cuba and Jamaica. The average sea-level temp. varies from 75° to 85° F., but like other tropical countries the range of climate coincides with elevation.

**Physical features.**—The valley between the maritime Andes and the Sierra Nevada de Merida is the most densely peopled part of the State. E. and S. of this lies a densely wooded, thinly peopled, and largely unknown mountainous region, separated from the Orinoco by llanos, grassy plains, or prairies, with wooded portions here and there. The mts. of the central highlands rise sharply from the coast to heights of 7000-9000 ft. The dry conditions are restricted to the first few hundred feet of the mt. slopes. Above that an abundant rainfall supports a cover of forest which continues to the tree line between 6000-7000 ft. above sea level. In the vicinity of Merida are five snowcapped peaks, about 16,000 ft. in altitude. The Sierra Nevada de Merida is the chief coffee-providing region of V. The llanos are uniformly level and largely flooded during the rainy season; the delta and borders of British Guiana are thickly forested and inhabited only by scattered Indian tribes. The pastures of the Valencia region have been long used for the fattening of cattle from the llanos. The savanna varies from tall bunch grasses which grow in the drier parts to the short grass of the wet spots. The Orinoco is navigable for large steamers for 375 m. to Ciudad Bolivar, the centre of the riv. trade, a place of 20,000 inhabitants, with steamer connection with Trinidad. Navigation varies greatly, the riv. being much lower in the dry season. Altogether there are some 11,000 m. of navigable water in V.

**Constitution and government.**—In 1830 V. seceded from the republic of Colombia, and its present constitution dates from July 5, 1947. Congress consists of 2 chambers, a senate of 40 members, and a chamber of 98 deputies, elected for 5 years by universal adult suffrage. The president

is elected by universal secret ballot for 5 years. He exercises executive power in conjunction with the cabinet ministers, through whom he acts, and has a modified power of veto.

**Political divisions, population, and area.**—The country is divided into a federal dist., 20 states and 2 ters, with a total pop. according to the 1941 census of 3,850,770. The chief tns. (with pop.) are: Caracas (cap.), 377,000 (estimated 1949); Barquisimeto, 154,200; Maracaibo, 112,500; Valencia, 85,000; San Cristobal, 32,000; Puerto Cabello, 32,000; Maracay, 30,000; Carupano, 26,000; Ciudad Bolívar, 25,000; and La Guaira (the prin. port of V.). Of the pop. 10 per cent are white, chiefly of Sp. descent; 70 per cent mestizos, probably the largest proportion in any of the S. Amer. states; the remainder Indians, Negroes, and foreigners. Europeans are concentrated in the large tns. Pure Indians survive only in the more remote places—the Guana highlands, S. of the Orinoco or in the forests W. of Maracaibo. The Negro mixture is greatest along the Caribbean coast, in such parts as La Guaira and Puerto Cabello.

The States have separate legislative assemblies and constitutions, with a president; they are divided into dists. and municipalities. The Federal dist. and the territories are administered by the president through governors. The area of U. is approximately 352,140 sq. m., four-fifths of which forms part of the basin of the Orinoco.

**Production.**—The surface of V. comprises three well-marked zones—the agric., the pastoral and the forest. In the first are grown coffee (nearly 540,000 ac.), cocoa (13,000 plantations), wheat, rice, tobacco, cotton, maize, sugar-cane (about 18,000 plantations); the second is given over to stock-raising; and the third, which covers half the country, produces caoutchouc, balata (a kind of gum somewhat like rubber), copaiba, vanilla, etc.; but the forest resources are scarcely tapped. Over one-fifth of the people are engaged in agriculture or in cattle-raising. There are four million oxen in V., one-and-a-third million goats and more than 350,000 pigs. V. is the second largest petroleum-producing country in the world. The oil concessions cover over 1 1/2 m. ac. and oil accounts for 90 per cent of total exports. The output has increased from 19 m. barrels in 1925 to over 430 m. barrels in 1947 and in the latter year export of petroleum and by-products amounted to over 396 m. barrels. The basin of Lake Maracaibo is the most prolific S. Amer. source of oil. There is another oil-field in eastern V., in the States of Anzoátegui and Monagas and the Ter. of Delta Amacuro. Other minerals are gold (found near Ciudad Bolívar), copper ore, magnesite, coal (obtained in the vicinity of Coro, and Nariacual), iron, sulphur, and salt. Iron is obtained in the Imataca Mts. and the delta. Coal and petroleum are sought chiefly in the regions of Lake Maracaibo and the R. Guasare. Pearl-fishing flourishes, especially around the is. of Margarita. There are but few second-

dary industries beyond cotton textiles of a cheap quality produced at Valencia and Caracas. Salt and matches are gov. monopolies. There are cement factories at Valencia, Barquisimeto, and Caracas, and a glass factory at Caracas.

The prin. exports in the order of their importance are petroleum, coffee, cacao, and gold. The prin. imports are machinery, textiles, foodstuffs, steel, and iron. Exports to V. from the U.K. in 1946 were valued at £4,744,000; imports from V. to the U.K. at £4,589,000. On June 30, 1930 V. paid off its entire external debt of 23 1/2 m. bolivars in gold, as a token of homage to Simon Bolívar, the Liberator. The official monetary unit is the bolivar, normally equal to 0.290323 grammes fine gold or 32.67 cents U.S.

**Communications.**—La Guaira is the chief port. There are seven railway companies, which owned together over 650 m. of railways in 1949. There are wireless stations at Caracas, Cristobal, Barquisimeto and in a number of other tns. There are some 6000 m. of road, of which 4000 m. are improved surface highways passable in all weathers.

**Religion and Education.**—The Rom. Catholic is the prevailing religion of V. There are two archbishops, one at Caracas and the other at Merida. There are also 8 suffragan bishops. Primary instruction is free and from the age of seven compulsory. The univs. are those of Los Andes at Merida with 700 students and the Central Univ. at Caracas (300 years old) with 2000 students. A Workers' Univ. in Caracas was set up by law of 9 Oct., 1947.

**Defence.**—By a law of 1942 all males who have reached the age of eighteen must serve in the active military forces for periods ranging from 1 to 3 years. All serve in the reserve afterwards until the age of forty-five. The active army has an estab. of 10,000 men of all ranks and consists of 8 infantry brigades; a corps of artillery, engineers, and other auxiliaries, and also aviation services.

**History.**—V. was first visited by Columbus in 1498, and in the following year by Alonso de Ojeda and Amerigo Vespucci. The country remained under Sp. rule until the revolution under Simon Bolívar (q.v.), when its independence was won at the battles of Lastoguanes (1813) and Carabobo (1821). V. was part of the Federal Republic of Colombia until 1830, but thereafter became absolutely independent. There have been a number of revolutions since 1846, and in 1864 the country was divided by President Falcón into states and formed into a Federal republic. Between 1830 and 1935, V. had more than a dozen rulers, but three were pre-eminent; Páez, the half-Indian peon, who declared the independence of V. in 1830; Guzmán Blanco, who assumed office in 1870; and Juan Vicente Gómez (1909-35). Under each of these despots V. was ruled as a private estate for the benefit of the owner, but the result was the estab. of order among the different factions and a consequent increase of material prosperity. On the

dispute between Great Britain and the U.S.A., over the Venezuelan-British Guiana boundary, see ARBITRATION, *A. between Great Britain and the U.S.A.*; CLEVELAND, STEPHEN GROVER; and UNITED STATES, *History*. In Oct. 1945 a revolt broke out against the Conservative gov. of Gen. Medina, who had been elected president for 5 years from 1941. The leader of the revolt, Romulo Betancourt, assumed the presidency after a struggle of only 3 days and the new gov. was soon recognised by America, Britain, and France. A year later an elected constituent assembly drew up a new constitution, providing for a federal republic of 20 autonomous States, a federal dist. and two territories. The general election of Oct. 1946 was the first that had been held since 1881. See J. M. Spence, *The Land of Bolívar*, 1878; T. C. Dawson, *The South American Republics*, 1905; A. H. Keane, *Central and South America*, 1909; L. V. Dalton, *Venezuela*, 1912; C. R. Enock, *The Republics of Central and South America*, 1913 (2nd ed., 1922); P. L. Bell, *Venezuela* (Washington), 1922; L. M. Nesbitt, *Desolate Marches: Travels in the Orinoco Llanos of Venezuela*, 1935; E. Fergusson, *Venezuela* (New York), 1939; N. Roosevelt, *Venezuela's Place in the Sun* (New York), 1940; L. Alvarado, *Dados Etnograficos de Venezuela* (Caracas), 1945.

**Venice**, prov. of Italy on the Adriatic coast, between the mouths of the Brenta and Livenza rivs. Salt, fish, wheat, and rice are produced. Area 948 sq. m. Pop. (1947), 727,300.

**Venice** (It. *Venezia*), city, commune, and seaport of N. Italy, cap. of the prov. of V., is built mainly on piles, on 122 small is., intersected by canals, in the lagoon to the W. of the gulf of Venice at the head of the Adriatic. A railway viaduct, 22 m. long, connects it with the mainland. V. was noted for its textile manufs. as early as the fifteenth century, the prin. manufactures at the present time are tapestry, brocades, silks, Venetian laces, wood-carving, artistic wrought-iron work, jewellery, bronzes, machinery, and clocks, and at Murano glass and glass beads. Its trade is mostly in transport chiefly to the E. V. is a base of the It. navy. A great new commercial port was under construction on the mainland before the Second World War. The pop. in 1947 was 303,200.

The distinctive features of V. are its situation in the lagoon and the canals by which it is intersected and by which all but foot traffic is conducted. Of its public buildings the following are the prin.: The Doge's palace, standing on the site of a former official residence of the Doges, which was burnt in 976—besides its painted ceilings and walls, there are many pictures by the It. masters; the Accademia, whose twenty rooms are filled with some of the finest works of the Old Masters; and the Museo Civico, with its collection of antiquities. Its churches, amongst which the prin. are the cathedral of San Marco, San Giorgio Maggiore, and Sta. Maria della Salute, are all most highly

decorated with frescoes, mosaics, and carvings, besides containing many world-famed pictures. The Campanile of St. Marco, after standing a thousand years, fell on July 14, 1902, but was afterwards rebuilt. The palaces of the nobility on the Grand Canal and other canals contain priceless collections of pictures. The Arsenal contains many models of the old Venetian ships, armour, collections of weapons, and spoils of war. An is. to the S.E., the Lido, is a favourite seaside resort. *The Arts in Venice*.—The earliest art in V. was Byzantine, and V. lagged behind other It. cities in forming a native style, but her masons, mosaicists, and glass workers soon became world famed. Amongst the foremost painters of the Venetian school are: Antonio Veneziano, the Vivarini, Jacopo Bellini and his sons and pupils, Carpaccio, Giorgione, Titian, Palma Vecchio, Sebastiano del Piombo, and Pordenone. During the fifteenth century printing fl. in V. to such an extent that more books came from its presses than from Rome, Milan, Florence, and Naples together.

*History*.—The hist. of V. commences with the inhab. of the plain to the N. of the Adriatic taking refuge from the incursions of barbarian tribes in the is. of the lagoon, first as a temporary measure about 452. In 466 they took the first steps towards a corporate existence, but it was not till 568 that they abandoned the idea of a return to the mainland. At first the community was spread over twelve townships on various is., of which Iialto, now V., was not the most important. After generations of struggle with the Lombards and the empire, V. became not only the greatest maritime power in Italy, but one of the most powerful in the world, trading with the Far E. and distributing its imports throughout W. Europe, founding colonies and factories in the Morca, at Constantinople, and in many of the coast lns. of Syria, and acquiring ter. on the mainland extending from the Adriatic to the Alps between the Minio and the Po on the W. and the Isonza on the E. During this period she found a strong rival in Genoa, the next important of the It. maritime states, and had to protect her shipping from the Dalmatian pirates, besides having many encounters with the empire and neighbouring mainland states. She took a leading part in the transport of the Crusaders to the Holy Land, and made vast sums out of this and her trading transactions. In the latter half of the fifteenth century, after gallant struggles, her decline commenced, of which the chief causes were the Turkish conquest of Constantinople, the discovery of the Cape route, and the rise of the great European Powers and their dominance in Italy generally; but the end did not come till 1796, when Napoleon, after the war with Austria, took possession of the city. V. suffered only slight damage in the Second World War.

**Venizelos, Eleutherios** (1864–1936), Gk. statesman, b. at Canea in Crete. He became minister of justice and foreign



affairs in Crete (1898). Although he was a Republican, he nevertheless remained loyal to the crown so long as he felt that the crown was loyal to the interests of the Gk. nation. He was Premier of Crete in 1909 and of Greece two years later, having saved the dynasty during the Balkan crisis of 1909-10 by his masterly revision of the Constitution and co-operation in forming the Balkan Alliance of 1912. At the very outset of the First World War he advocated Gk. intervention on the side of the Entente, but found no support from King Constantine. In Oct. 1915 he resigned owing to differences with the king and the Gk. General Staff. Towards the end of 1916 V. set up a provisional revolutionary gov. at Salonika. Late in 1917 he returned to Athens, being recalled to office, after the abdication of Constantine, by King Alexander. He was now head of the National Gov. and contributed to the efficiency and success of the Allied army at Salonika, reorganising the Hellenic forces. With Politis, he was chosen as Gk. delegate to the Peace Conference in Paris in 1919. But the failure of the Gks. in the war with Turkey in 1921-22 embittered sentiment towards him (see GREECE-TURKISH WAR). After the revolution in Greece in 1922, however, he represented his country at the Lausanne Conference, and, in 1924, once more became Prime Minister, the country having meanwhile become a republic. From 1928 to 1932 following a dictatorship, he was again in power; in Crete he inspired a revolt against its acting regent, but the revolt was quelled and he was forced to flee. See lives by V. J. Seligman, 1920; S. B. Choster, 1921; and H. A. Gibbons, 1921.

**Venlo**, fortified tn. of the Netherlands in the prov. of Limburg, on the Maas. Industries include engineering, and the manuf. of tobacco, paper, and electric lamps. It was the scene of heavy fighting late in the Second World War (see WESTERN FRONT IN SECOND WORLD WAR). Pop. 40,500.

**Venomous bites and stings.** Some snakes are provided with poison-glands connected with grooved fangs. One lizard, the heloderma of N. America, has poison-glands. Centipedes have poison-sacs connected with the jaws. Spiders paralyse their prey by stabbing with poison-claws, and scorpions have a sting or telson at the end of the 'tail' (abdomen). For first-aid treatment in snake bite, the wound should be enlarged, and suction applied; an injection of antivenine should be given if available. The adder (viper) is the only poisonous snake in Great Britain. See also INSECT BITES AND STINGS.

**Ventilation**, the removal of stale or vitiated air and its replacement by fresh air. Atmospheric air is a mixture of oxygen and nitrogen with a small amount of carbon dioxide (in cities about 4 parts in 10,000 by valency). In breathing, the oxygen is used up and carbon dioxide exhaled, and a steady supply of oxygen is therefore essential to life. Excess of carbon dioxide, above 6 parts in 10,000,

makes the air foul, but it is now considered that the carbon dioxide is not in itself injurious to health; though its presence in excess is a useful indicator of organic impurities. Besides an adequate supply of oxygen, and a suitable temp. and humidity, it has been found that movement of air around the body is necessary for the feeling of freshness and comfort. Under normal conditions this movement should be at the rate of 20-40 ft. per min. at least, and more vigorous at head level than at the ground; there should be no pockets of stagnant air and no draught. Up to a temp. of 70° F. a relative humidity of 30-70 per cent is suitable. In winter, when the incoming air is heated before or at entering the room, the air is usually too dry and evaporation should be used.

In factories and mines (see under COAL-MINING) where noxious gases or fumes, smoke, and dust are produced, the removal of impurities and the supply and circulation of fresh air demands special attention and no numerical standard can be laid down. The Factories Act (1937) stipulates that an adequate standard of general V. should be provided, and harmful dust and fumes should be removed or rendered innocuous at the source. The problem of V. becomes particularly complicated in coal mines with long workings extending often many m. underground and connected with the open air only through the shafts, where high temps. at the same time make V. very important.

**Natural Ventilation.**—In the case of dwelling-houses it is usually considered sufficient to provide suitable inlet and outlet openings in the walls and to depend on the wind and on convection currents due to temp. differences to produce the required movement of the air, but in large blocks of flats the effects on prevailing wind direction and velocity of neighbouring buildings, enclosed courts, lift wells, and light wells, must be carefully studied. In rooms with an open coal fire the flue acts as outlet and the inlet should be placed at a high level in the wall opposite or far removed from the fire. The coal fire is a very efficient ventilator; a gas fire also acts as ventilator if fitted to an ordinary flue. In rooms without coal or gas fires, where closed stoves or radiators are used, inlets should be placed at a low level and outlets near the ceiling.

**Mechanical ventilation and air conditioning.**—In its simplest form a ventilating system may be simply an electric fan in the roof or high on a wall extracting air from the room; a refinement would be another fan bringing fresh air to the room. The input fan would sometimes have a heater mounted in front of it, consisting of a steam or hot water coil or an electric element. When the fan and heater are in one unit they are known as unit heaters, and are usually thermostatically controlled.

V. for a complete building consists usually of a system of ducts distributing air from a central fan installation; a main heater is also used in some installations. When the air in addition to being heated

is also filtered and washed, the plant is usually termed an air conditioning plant and is generally fully automatic. An air conditioning plant consists of a fresh air inlet, a return air inlet (air from conditioned space), a filter, water sprays, a heater battery, and a fan. In some plants a refrigerator is fitted for summer use, but the cost of refrigeration is still very considerable, and rarely justified by Eng. summer conditions.

See O. Faber and J. R. Kell, *Heating and Air Conditioning of Buildings*, 1937; A. A. Jones, *Modern Heating and Ventilation*, 1935; J. Porzós, *Handbook of Heating, Ventilating, and Air Conditioning*, 1942; and British Standards Code of Practice (CP 3 CH 1(c)), *Ventilation*.

**Ventimiglia** (Fr. *Ventimille*), port of Liguria, Italy, and frontier tn. between France and Italy. It has a fine Gothic cathedral, and the celebrated Balzi Rossi grottoes, containing palaeolithic remains. In the Second World War a shell-hit on the façade did considerable damage to the cathedral. Pop. 14,900.

**Ventnor**, tn. in the Isle of Wight. The climate is mild and suitable for invalids and consumptives. In the summer V. is a pleasure resort. St. Boniface Down, a hill rising to 764 ft. behind the tn., is a property of the National Trust. The Royal National Hospital for consumption and diseases of the chest is outside the tn. Pop. 6,900.

**Ventriloquism**, art of speaking in such a manner that the sound appears to be produced at a distance from the speaker. The origin of the word, from *venter*, belly, suggests that the voice was supposed to proceed from the speaker's stomach. The words are, however, produced in the usual manner, though some consonants may be masked by the immobility of the lips and teeth and the restricted use of the tongue. The art was practised by the anc. Gks. and Egyptians. See A. Prince, *Whole Art of Ventriloquism*, 1920; S. Vereker, *Ventriloquism as a Hobby*, 1938; and D. Craggs, *The A.B.C. of Ventriloquism*, 1946.

**Ventspils**, formerly **Windau**, seaport of the Latvian S.S.R., in Courland, at the mouth of the R. Windau, which here forms a small harbour. Like Liepāja (formerly Lübau) V. is practically ice free and both were outposts for Riga's export trade from Russia. Pop. 16,000.

**Venus**. In an indictment the V. is the statement of the co. or other geographical div. from which the sheriff has summoned the grand jury by whom a 'true bill' has been found (see INDICTMENT, and JURY), and also, as a rule, the place where the crime was committed. As the V. should, by the common law, be the jurisdiction within which the crime was committed, the trial generally takes place there too. But to this general rule there are exceptions, e.g. offences committed by persons on a Brit. ship (see MERCHANT SHIPPING) may be tried in any county where the offender is in custody, offences against the Customs Acts are triable in any co.; again the V. as to forgery, bigamy, larceny, or embezzlement by public

servants may be laid either in the co. where the crime was committed, or in the place of arrest; and there are special rules applying where the offence was committed partly in one and partly in another co.

**Venus**, goddess, see APHRODITE.

**Venus**, most conspicuous and the brightest planet. Phosphorus, the morning star, and Hesperus, the evening star, was its name among the Gks. It is frequently visible in daylight. It moves at a mean distance from the sun of 67.2 million m. in an orbit of less eccentricity, .007, than that of any other planet, at a velocity of 22 m. per sec.; the revolution is completed in 225 days (its sidereal period), its synodic period being a year and seven months. The inclination of its orbit to the plane of the ecliptic is under 3½°. The apparent diameter varies from 10" to 61", its distance from the earth varying from 26 to 160 million m. The real diameter is 7600 m., the planet being practically the same size as the earth therefore, and her mass is 83 per cent. density 91 per cent. superficial gravity 90 per cent. those of the earth. Owing to her position inside the earth's orbit V. exhibits phases; the discovery of the gibbous phase by Galileo in 1610 being one of the facts which disproves the Ptolemaic system, and supports that of Copernicus. The transit of V., its passage across the sun's disc at inferior conjunction, is a rare phenomenon, and has occurred only six times since 1600. The matter was of great importance as a means of determining the parallax (q.v.) of the sun, but more accurate methods are now adopted.

**Surface Markings**.—The lack of permanence in details revealed by photography makes it impossible to be certain about the period of V.'s rotation. Schiaparelli's observations led to a period of 225 days—the same as the period of revolution round the sun—but this view is not now accepted, and Ross suggested 30 days as a probable period. It is believed that the actual figures are close to this, though probably some days less. What is certain, however, is that the atmosphere of Venus contains a large amount of carbon dioxide but all attempts to detect oxygen and water vapour have failed. This does not mean that they do not exist in the atmosphere of Venus but only that they are not in sufficient quantity to be discovered. The temp. of the sunlight side of the planet is about 50° C., and that of the dark side is about 20° C. V. is a disappointing planet, when viewed through the telescope. About the time of inferior conjunction it displays a crescent disk like new moon, which increases from night to night, passing through all the phases characteristic of the waxing moon, until it looks like the full moon when it is in superior conjunction about 9½ months later. After this it goes through the phases of the waning moon, attaining the crescent-like new moon 9½ months later. V. is often described as a sister planet to the earth—a description which is very appropriate so far as size, mass, surface gravity are concerned—but in

other respects it differs considerably from the earth, in particular with regard to its atmosphere. While V. can be seen both as a morning and an evening star, it can never be seen all through the night though periodically it sets some hours after the sun, and at such times appears very brilliant in the heavens. The albedo of V.—the percentage reflected to the total light falling on the surface of a body—is 59 compared with moon's albedo of 7 per cent. A high albedo usually indicates the presence of a cloudy atmosphere—a condition prevailing on V.

**Venus's Fly-trap**, see *DIONÆA MUSCIPULA*.

**Vera Cruz**: 1. State of Mexico. The surface is broken up by large tidal lagoons and rivs., behind which is a gently rolling stretch of fertile lands which rise gradually to the base of the Sierras, whose valleys and precipitous wooded slopes form the S.-E. flank of the great centre tableland. The products are codar, fancy and hard woods, sugar, alcohol, vanilla, tobacco, bananas, and beans. There are textile mills and breweries in Orizaba, and soap factories and flour mills in the state. There are oil-fields in the N. and S. parts of the state. Jalapa (q.v.) is the cap. Area 27,736 sq. m. Pop. 1,619,300. 2. Seaport lying on the S.W. coast of the Gulf of Mexico, in the state of the same name. It is built on low-lying sand-banks and has a harbour protected by sea-walls. Cortez landed on the gulf coast near the site and founded the city of the True Cross or V. C. V. remains the chief Mexican port, equipped with breakwaters, and modern dock facilities. There are manufs. of furniture and tobacco: the prin. exports are metal ores, coffee, bananas, tobacco, hides, sugar, and rubber. Pop. 75,800.

**Veraguas**, prov. of Panama, extending across the isthmus. The cap. is Santiago. Pop. 83,500.

**Veratrine**, poisonous crystalline powder derived from *sabadilla* seeds by bruising, boiling in alcohol, and precipitation with an alkali. It is sometimes used externally as a local anæsthetic.

**Veratrum**, or **False Hellebore**, genus of perennial plants (family Liliaceæ) with decorative leaves and panicles of white, green, or purple flowers. *V. album* yields the poisonous powder known as *Hellebore powder*, which is mixed with water and used as an insecticide.

**Verbanus Lacus**, see *MAGGIORE LAKE*.

**Verbena**, or **Vervain**, genus of herbaceous plants and shrubs. *V. officinalis* is the common Brit. wayside plant, with slender spikes of small lilac flowers. There are about 100 species, mainly indigenous to tropical and subtropical America, some 20 being native to the U.S.A., a very few species occurring also in the Old World.

**Verbenaceæ**, family of trees, shrubs, and herbaceous plants, mostly tropical. The most important is *teak* (q.v.).

**Vercelli** (anc. **Vercellæ**), cap. of the prov. of V., on the Sesia, 12½ m. S.W. of Novara by rail, in Piedmont, Italy. There are large farms in the neighbourhood, and the tn. trades in rice. There are manufs.

of silks, silver ware, and machinery. The library contains the valuable **Vercelli Book** (q.v.), and there is a sixteenth-century cathedral. Pop. 41,100; (prov.), 372,900.

**Vercelli Book**, or **Codex Vercellensis**. Early Eng. MS., discovered in 1822 by Dr. Friedrich Blume, a Ger. jurist, in the cathedral library at Vercelli (see above). Besides six homilies and a prose 'Life of Guthlac,' it contains six poems, including 'Andreas,' the 'Dream of the Rood,' and an 'Address of the Soul to the Body.'

**Veroingetorix** (d. 46 B.C.), chieftain of the Aveni, a Gallic tribe. He led a revolt against the Romans, with great ability, but was captured by Cæsar after the fall of Alesia (52 B.C.). After adorning Cæsar's triumph of 45 B.C. he was put to death. See life by M. A. Leblond, 1937-38.

**Verde**, Cape, see *CAPE VERDE ISLANDS*.

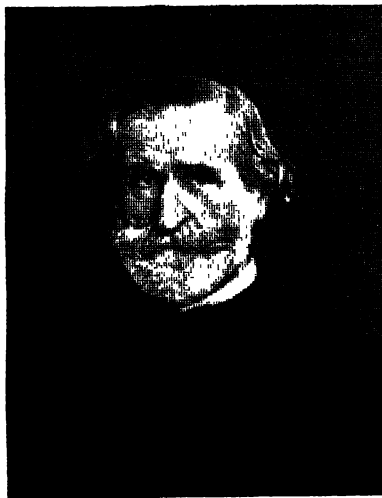
**Verdelho Wine**, see under *MADEIRA WINE*.

**Verden**, tn. of Lower Saxony, Germany 23 m. S.E. of Bremen. It is a riv. port and rail junction and has breweries and cigar factories. There is an anct. Gothic cathedral. In 782 Charlemagne decisively defeated the Saxons at V. From 1405 to the mid-sixteenth century it was a free imperial tn., passing to Sweden in 1648, to Denmark in 1712, and to Hanover by purchase in 1715. See C. Meyer, *Die Stadtgeschichte von Verden*, 1913. Pop. 10,800.

**Verdi**, **Giuseppe** (1813-1901), It. composer, b. at Le Roncole, near Busseto, Parma, son of a poor innkeeper and grocer. He became a choir-boy in the local church at the age of 7, and was taught by the organist, in whose place he was appointed in 1823. At 11 he went to school at Busseto. Barezzi, a friend of V.'s father, took him into his house in 1826, and he learnt much from the cathedral organist, Provesti. He had an overture performed and had composed for a military band in 1828, and the next year he wrote a symphony and deputised for Provesti. In 1831 V. was sent to Milan with a scholarship and some financial help from Barezzi, but was rejected by the Conservatoire as over entrance age. He studied, however, with Lavigna at the Scala Theatre. In 1836 he married Barezzi's daughter, Margherita, by whom he had two children; but the whole family died between 1838 and 1840.

Meanwhile V. had composed his first opera, *Oberto*, which was produced at La Scala in 1839. A second, *Un giorno di regno*, was a failure, having been composed at the time of his bereavements; but *Nabucco*, produced there in 1842, had a great success. In the east was Giuseppina Strepponi, who became a great and loyal friend and later V.'s second wife. *Ernani* was produced in 1844, *Rigoletto* in 1851, *Il Trovatore*, and *La Traviata* in 1853. In 1871 V. excelled his previous efforts with *Aida*; then, in his old age, after a long interval, he produced his two great Shakespearean masterpieces: *Otello* (1887) and *Falstaff* (1893). Three other famous works of V. deserve notice: the

*Requiem* (1874) in memory of Alessandro Monzoni, the *Slabat Mater* (1898), and the brilliant Sicilian Vespers (1855). V. is the artistic successor of Donizetti, exhibiting the same wealth of sentimental, passionate music, and the same power of enlightening the pathos or tragedy of the denouement by a simple and suggestive spirituality. He was also influenced, especially in his early years by Rossini; and his religious works owe much to the inspiration of Palestrina. He undoubtedly absorbed some of the style of operatic presentation of Wagner: but his



VERDI: PORTRAIT BY BOLDINI

music was essentially It. in character, and owed little or nothing to Wagnerian influences. V. always deeply resented the charges of Wagnerian 'copyism' of which he was sometimes accused. His musical development was as varied as that of Beethoven: his lyricism was always constant, but his last works show also a rare spirituality and religious consciousness which places him among the foremost composers in the field of sacred, as well as of operatic, music. See lives and studies by C. Bellaigue, 1911; A. Weissmann, 1922; M. Bonaventura, 1923; E. Checci, 1926; F. Werfel, 1924, 1944; F. Bonavia, 1930, 1947; A. Alberti, 1931; C. Gatti, 1931; F. Toye, 1931; M. Chop, 1938; D. Hussey, 1940, 1948; and H. Rutters, 1949.

**Verdict.** In civil trials, the jury, after the judge has summed up the evidence, determine by their V. all issues of fact, and, if they find for the plaintiff, assess the damages. Damages are said to be 'liquidated' when the jury can arrive at the amount by mere arithmetic or calculate them according to a scale of charges or some other accepted rate or percentage

(see *Odger's Principle of Pleading*). But when the amount is arrived at after consideration of all the circumstances, including the conduct of the parties, the damages are 'unliquidated.' In this latter case they may be *contemptuous*, when the jury think the plaintiff ought never to have brought his action; *nominal*, when, though the plaintiff was justified in suing, he has suffered no special damage, and has sued rather to clear his character or establish a right; *substantial*, when the plaintiff is entitled to fair compensation; and *vindictive*, when the jury desire to punish the defendant by making an example of him (this is permissible only in actions of breach of promise, libel, seduction, assault, malicious prosecution, false imprisonment, trespass, and slander). In criminal law Vs. are said to be either (1) general, i.e. guilty or not guilty; or (2) *partial*, i.e. guilty on one count (see *INDICTMENT*) and not guilty on the rest; or (3) *special*, i.e. where the jury find a certain state of facts and leave it to the judge to decide upon those facts whether the offence charged has been committed. In Scots law there is a middle V. of *non-proven*, but Eng. jurisprudence has never favoured any rule that militates against finality one way or the other in criminal trials. Where the jury cannot agree they must be discharged and the accused is then tried before a new jury. If a juror dies or is taken ill a similar result follows. Before a jury arrive at a V. they ought to satisfy themselves (a) that the facts are satisfactorily proved; and (b) that the circumstantial evidence (see *EVIDENCE*) is not only consistent with guilt, but is inconsistent with any other reasonable conclusion.

**Verdigris**, see under *ACETIC ACID*.

**Verdun:** 1. Tn. and first-class fortress on the Meuse, in the dept. of Meuse, France. It was the site of a Gallic settlement, and later of the Rom. fortress *Verodunum*. The cathedral of Notre Dame is not ant., but the bishopric, the most famous occupant of which was St. Vanne (d. 525), goes back to the third century. It was here that the treaty authorising the threefold partition of the Frankish empire was signed in 843. Pop. 14,600. 2. City in Jacques Cartier co., Quebec, Canada, on the St. Lawrence R., and on the Canadian National Railway, a W. suburb of Montreal. It is named after Saverdun, bp. of Dupuis, who in 1672 received a grant of land. V. is a residential suburb of Montreal. Pop. 76,900.

**Verdun, Battle of (1916)**, began on Feb. 21, 1916, and continued, intermittently, until June 1916. (For the political considerations which decided the Ger. Gov. to endeavour, at all costs, to take Verdun, see *WORLD WAR, FIRST*). The attack, in the first phase of this remarkable battle, or series of battles, was heralded by an artillery bombardment of quite exceptional intensity. A few days later the Ger. infantry, wave upon wave, advanced up the slopes of Douaumont Hill (see *DOUAUMONT*) suffering extraordinary casualties from the famous Fr. 75s and mitrailleuses. Gen. Pétain's arrival with

timely reinforcement thwarted this plan, and, the following day, a Fr. counter-attack was ordered which, in the result, changed the whole aspect of the attack. For days a tremendous battle was waged around the ruins of Fort Douaumont and by the first day of March the Ger. attack slackened, a respite which enabled the Fr. to bring up ever more reinforcements and supplies. In the first phase of the struggle for Verdun, the Fr. had been called on to defend the heights of the Meuse, but, in the next phase, the struggle was transferred to the W. bank of the Meuse, the Ger. object being to remove the Fr. threat across the riv., so as to turn Douaumont by taking Pepper Ridge which, like Douaumont, lay in a commanding position to the N. of Verdun. The fiercest fighting raged round Mort Homme, the key of the position on the W. bank of the riv., but, though the fighting continued throughout March and into April, the Ger. effort failed to gain the coveted city. Still undaunted, the Gers. at the end of May, launched the most desperate attacks on both sides of the riv. and, after a struggle of amazing intensity, during which Gen. Nivelle vainly counter-attacked to regain Douaumont, the Gers. succeeded in capturing Fort Vaux, on June 7, and thus, at all events, had won two important positions of the exterior ring of the permanent fortifications. This, however, marked the limit of Ger. success, for the next important fort, Souville, was never reached, and the Fr. were never driven from the S. slopes of the Mort Homme hill, so that Verdun was saved, and all the Gers. had gained in return for the vast sacrifices made were a piece of ter. N.E. of Verdun and less than 12 sq. m., two shattered forts, and some ruined vils. It is computed that the Ger. casualties were about 300,000.

**Vere, Sir Aubrey de**, see DE VERE SIR AUBREY.

**Vere, Aubrey Thomas de**, see DE VERE, AUBREY THOMAS.

**Vereeniging**, manufacturing centre and pleasure resort in the Transvaal, S. Africa, on the R. Vaal, 49 m. from Johannesburg. Coal is mined in the vicinity on both sides of the riv. and there are iron and steel works, brick and tile works, and electric power stations. Here is one of the largest generating stations in the empire, using much coal from the Cornelia colliery, 1 m. distant. The negotiations and the acceptance of the terms of peace in the S. African war of 1899-1902 took place here. Pop. European, 15,000; native, 33,400.

**Vergara**, see BERGARA.

**Verge-board**, see BARGE-BOARD.

**Vergil**, see VIRGIL.

**Vergil, Polydore**, or 'De Castello' (c. 1470-c. 1555). It. writer, spent the first and last years of his life in Urbino, his bp., but lived in England (1501-50). He was appointed archdeacon of Wells in 1508 and prebend of Oxgate in St. Paul's in 1513. *Historia Anglica* in six books (1533), which closes with Henry VII., is still consulted as an authority. It was pub.

in Eng. for the Camden Soc., 1844-46.

**Vergniaud, Pierre Victorien** (1753-93), Fr. orator and revolutionist, b. at Limoges. He entered the National Assembly in 1791, where he became leader of the Girondists, and, in Dec. 1792, urged an appeal to the people to decide the king's fate. With twenty-one fellow-Girondists he fell a victim to the Reign of Terror.

**Verhaeren, Emile** (1855-1916), Belgian poet, b. at Saint-Amand near Antwerp, only son of Gustave V., a well-to-do retired draper, and educated at the Jesuit College of St. Barbe, Ghent, and Louvain Univ. He was greatly influenced by Zola, and pub. (1883), *Les Flamandes*, a vol. of high-spirited poetry that shocked the respectable. A period of travel (including visits to London) was marked by: *Les Moines* (1886); *Les Soirs* (1887); *Les Débâcles* (1888); and *Les Flambeaux noirs* (1890), the last three pathological. Recovering from a severe nervous breakdown, he began to work the vein for which he is famous, realistic studies of modern life and labour; e.g.: *Les Campagnes hallucinées* (1893); *Les Villages illusoirs* (1895); *Les Villes tentaculaires* (1895). In the same vein were: *Usages de la rue* (1899); and *Les Forces tumultueuses* (1902). A greater calm is reflected in *Les Heures Claires* (1896), *Les Heures de l'Après-midi* (1905), and *Les Heures du Soir* (1911). *Love Poems* were trans. by F. S. Flint (1916). See lives and studies by P. M. Jones, 1926; E. Estève, 1928; C. Brutsch, 1929; E. Kuchler, 1930; A. Mockel, 1932; and R. T. Sussex, 1938.

**Veria**, or **Verria**, see BERGIA.

**Verkhyoyansk**, settlement on the Upper Yana R., in the Yakut A.S.S.R. It is inhabited by Turkish-speaking Yakuts, and political exiles were once also drafted here. In geographical structure and relief the V. system consists of a large number of mt. ranges arranged in four parallel arcs, nearly 300 m. wide. The greatest heights of the range are about 8000 ft. The 'cold pole' of the world is situated at V., where the Jan. mean is -59°, the mean minimum -83°, and the lowest reading anywhere (-90°) has been recorded (Feb. 1892). The average summer at V. lasts only about 2 months. Tin-mining has developed near V. in the Yana valley, together with the exploitation of nickel, silver, molybdenum, and lead. The pop. of V. and the surrounding dist. is about 5000.

**Verlaine, Paul** (1844-96), Fr. poet, b. at Metz. He chose Fr. nationality in 1873. His lyrics are of the so-called impressionist type: half-sensuous, half-mystic, intensely beautiful in inspiration and subtle in rhythm, akin to the music of Debussy, who has set some of them, e.g. the *Fêtes galantes*. His early paganism, responsible for such Baudelairean works as the *Fêtes galantes* (1869), inspired by the paintings of Watteau, *Poèmes saturniens* (1865), and *La Bonne Chanson* (1870), was superseded (after twelve years of a life of dissipation broken by illness) by devout Catholicism, which he adopted during his imprisonment at Mons for shooting at the poet Rimbaud. *Sagesse* (1881) is on a

level with the finest religious poems ever written. Other works: *Romances sans paroles*, 1874; *Jadis et naguère*, 1884; *Amour*, 1885; *Bonheur*, 1839; *Parallèlement*, 1890, etc. V. gave to Fr. poetry an entirely new and original music and broke away from the stilted Alexandrine verse. The melody of his poetry has found no rivals: V. combined this power of sound with, very frequently, deep emotionalism, and the combination produced a sense of poetry that was sharply poignant and extremely beautiful, without descending to sentimentality of any sort. At his greatest he ranks with Heine as one of the lyric singers who defies translation and imitation. See lives by L. Lepelletier, 1909; M. Coulon, 1929; F. Porché, 1933; and G. Haug, 1944; also F. A. Cazals and Le Rouge, *Les Derniers Jours de Paul Verlaine*, 1923; D. Saurat, *Modern French Literature*, 1946.

**Vermeer**, or **Van der Meer Jan**, (1632-75), Dutch painter, b. in Delft. Little is known of his life. He married in 1652, and was admitted to the Guild of Painters of Delft. He probably studied under Karel Fabritius, a pupil of Rembrandt. In 1662 he was master of the Guild, and again in 1670.

After his death he was forgotten, his work being assigned to Peter de Hooch and others. He was 'discovered' in 1866 by the Fr. critic Théophile Thoré, who wrote under the name W. Burger. V. is now recognised as the most perfect of the Dutch masters in point of technique. His greatest qualities are his capacity for careful design and his feeling for the play of light on colour, shown to perfection in his interiors. Forty-one pictures have been assigned to him. Of these the 'View of Delft' and the 'Head of a Girl' are in the Mauritshuis, The Hague; and 'The Pianist,' and 'Young Woman at the Clavichord,' are in the National Gallery, London. A number of pictures are in the U.S.A. Sev. paintings attributed to V. and acquired by public collections, notably 'Christ at Emmaus,' were proved to be forgeries in 1945. See lives and studies by C. H. de Groot, 1909; A. E. Gallatin, 1917; G. Vanzyge, 1921; E. V. Lucas, 1922 and 1929; H. G. Fell, 1933-34; A. B. de Vries, 1948; and F. van Thienen, 1949.

**Vermejo**, see BERMEJO, RIO.

**Vermicelli**, popular food in Italy, and so-called because it consists of worm-like threads (from It. *vermicello*, a little worm), made from the granular meal of certain kinds of wheat.

**Vermillion**, red variety of mercuric sulphide, HgS. It may be obtained by subliming the black sulphide formed by triturating mercury and sulphur together in a mortar. It is also prepared by digesting the black amorphous sulphide for some hours in alkaline sulphides. V. is used as a pigment, but is commonly adulterated with ferric oxide and red lead. On heating it readily sublimates, and this constitutes a test of its purity. V. occurs naturally as the red mineral cinnabar.

**Vermin**, general term for noxious animals, or those destructive to crops and

game. Rats, mice, moles, weasels, foxes, and polecats are V. In Great Britain, by an Act of 1919, persons who do not destroy rats and mice on their land, wherever it is reasonably possible to do so, may be fined. The word is also used of the insect parasites of man, lice, fleas, etc.

**Vermiland**, or **Karlstad**, län in the S.W. of Sweden, lying to the N. of Lake Vener and adjoining Norway. Copper and iron are mined and there is an important wood-pulp industry. Cap. Karlstad. Area 7427 sq. m. Pop. 274,600.

**Vermont**, known as the 'Green Mountain State,' a New England State of the U.S.A., remarkable in its group for having no seaboard. It is bounded on the N. by Canada, on the E. by New Hampshire, on the S. by Massachusetts, and on the W. by New York. Lake Champlain, about 100 m. long, forms part of the W. boundary. The name ('Verd Mont') has reference to the Green Mts. (highest peak, Mt. Mansfield, 4364 ft.), which traverse it from N. to S. V. is primarily an agric. State, producing oats, maize, barley, hay, potatoes, maple-sugar, and apples. Its output of dairy products is among the greatest in the U.S.A. and it leads in the production of maple syrup and maple sugar, the output being (1947), 777,000 galls. of syrup and 191,000 lb. of sugar. The quarrying of marble, granite, and slate is the most profitable industry, asbestos and talc are produced, and there is lumbering and timbering. State forests and State forest parks cover 78,600 ac. Metal founding, flour milling, and the manuf. of hosiery, other woollen goods, and paper are also important. It has probably the fewest people of colour of any State, its white pop. being 99.8 per cent.

V. was the first State to be admitted to the Union formed by the original States. The legislature has 30 senators and 246 representatives; 1 representative is sent to Congress. The cap., Montpelier in 1940 had a pop. of 8000. Other tns.: Burlington, 27,700; Rutland, 17,000; Barre, 11,000. Area 9609 sq. m. Pop. (estimated 1948), 374,000. See W. H. Crockett, *Vermont: the Green Mountain State*, 1921; and Federal Writer's Project, *Vermont: A Guide to the Green Mountain State*, 1937.

**Vermouth**, aromatic fortified wine prepared in France and Italy. The basis of the beverage is a white wine of tonic properties, which is flavoured by the maceration of bitter herbs and fortified by the addition of alcohol. It. V. is more syrupy than Fr. V.

**Verne, Jules** (1828-1905), Fr. novelist, b. at Nantes. He first popularised that species of romance in which all kinds of more or less plausible scientific discoveries are made the basis of the most extravagant and thrilling adventures. His best stories are *Twenty Thousand Leagues under the Sea* (1869); *Round the World in Eighty Days* (1872); *Five Weeks in a Balloon* (1862), his first success; and *Michael Strogoff* (1880). See A. de la Flîve, *Jules Verne, sa vie et son œuvre*, 1928; and K. Allott, *Jules Verne*, 1940.

**Verner, Frederick Arthur** (1836-1928), Canadian painter, *b.* at Sheridan, Ontario. He studied art in England, where he joined the army, and served with Garibaldi in Italy, returning to Canada in 1862. His work shows a fine quality of atmospheric colouring, and his brushwork is smooth. Buffalo subjects and life in the W. were his favourite topics. He is represented in the National Gallery of Canada by four pictures.

**Verner's Law**, phonetic law propounded in 1875 by the Dan. philologist Karl Adolf Verner (1846-96), *b.* at Aarhus, Jutland; univ. prof. of Slavonic studies at Copenhagen. Its discovery was the result of investigations intended to solve certain difficulties and irregularities left unexplained by Grimm's Law (*q.v.*). In his outstanding article *Eine Ausnahme der ersten Lautverschiebung*, in *Zeitschrift für vergleichende Sprachforschung*, 23 (1877), pp. 97-130, Verner tries to reconstruct the position of the accent in the hypothetical original Indo-European, and suggests that when the accent falls on the syllable before the consonant, Grimm's Law holds good; but when it falls on the following syllable, *p*, *t*, and *k*, become continuant *f*, *d*, and *g* later becoming stop *p*, *t*, and *g*, in most positions: *e.g.*, Indo-European *bhr̥tēr*, *cf.*: anct. Indian *bhr̥tā* (Gk. *φάτις*) gives Gothic *broþar*, Eng. *brother*, but Indo-European *pater*, *cf.*, anct. Indian *pitā* (Gk. *πάτηρ*), gives Gothic *fadar*, Old High Ger. *fater*, Old Eng. *fader*.

**Vernet, Antoine Charles Horace** (1758-1836), Fr. painter, *b.* in Paris, and commonly called **Carle Vernet**. His 'Triumph of Paulus Æmilius' shows how much he had profited by his study of horses at riding schools and races. The 'Morning of Ansterlitz' and the 'Battle of Marengo' are two of his finest works.

**Verney, Sir Edmund** (1590-1642), Eng. knight-marshal and standard-bearer, member of an old Buckinghamshire family, educated at Oxford. In 1623 he accompanied Prince Charles and Buckingham to Madrid. From 1624 he was a member of Parliament, and when King Charles appointed him knight-marshal in 1626, the Marshalsea prison became his charge. He was killed at the battle of Edgehill, fighting for the king, though his personal sympathies lay with the Puritans. An excellent picture of seventeenth-century life in the circles of the landed gentry is given in the papers of the V. family. These comprise *Letters and Papers of the Verney Family down to 1640* (ed. J. Bruce, 1853), and *Memoirs of the Verney Family* (ed. Lady F. P. and Lady M. M. Verney, 1892-9, 1904).

**Vernier**, device invented by Pierre Vernier (*c.* 1580-1637) for reading the fractions of the smaller parts of a measuring scale. It is a scale which slides along the prin. scale, and is divided so that *n* of its divisions corresponds to *n* - 1 or *n* + 1 divisions on the prin. scale. It is used on all instruments which make linear or angular measurements, *e.g.* barometers, cathetometers, theodolites, sextants, tele-

scopes, etc. Where *n* divisions correspond to *n* + 1 divisions on the sliding scale, suppose the prin. scale to be divided into tenths of an inch; then nine divisions on the prin. corresponding to ten on the sliding scale, and each division on the V. is equal to nine-hundredths of an inch. If the zero of the V. coincide with the division 10 of the prin. scale, then the 10 of the V. coincides with the 19 of the prin. If the V. be moved so that its line 1 coincides with 11 of the scale, clearly then the V. has been moved through one-tenth of a scale division. Similarly, if 2 on the V. is made to coincide with 12 of the scale, the displacement of the V. is two-tenths of a division. Thus, to read the V., note the position of its zero and take the value of the nearest division, then look for the lines coinciding in V. and scale, and this gives the fraction of the division beyond the scale mark nearest 0.



Thus in the figure the V. 3 coincides with the scale 10 and the nearest division to the zero is 7, and since the scale is graduated in tenths the length from 0 on the scale to 0 on the V. is .73 in.

**Vernon, Edward** (1684-1757), Eng. admiral, educated at Westminster School. He served at the siege of Gibraltar under Sir George Rooke (1704) and in the W. Indies and the Baltic, and in 1739 captured Porto Bello with only six ships, an achievement celebrated in London with public fires.

**Vernon, tn.** in the dept. of Eure, France, situated on the R. Seine, built in 1123 by Henry I. of England. It manufs. chemicals and has stone quarries, mineral springs, and artillery engineering estabs. The tn. was damaged in the Second World War, being the scene of the first Brit. crossing of the Seine, on Aug. 26, 1914. Pop 1200.

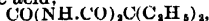
**Verocchio**, *see* VERROCCHIO.

**Verolamium**, *see* VERULAMUM.

**Verona**, city on the Adige, 71 m. W. of Venice by rail, in the prov. of the same name and region of Venetia, Italy. The triumphal arch now called the Porta de' Borsari, a bridge, the huge amphitheatre, and some ornamental mosaic pavement recall Rom. times. The twelfth-century basilica of St. Zeno, the cathedral (consecrated in 1187), which contains the tomb of Pope Lucius III., and likewise the Dominican church of St. Anastasia (1261-1422), with its beautiful painting of St. George by Pisanello, are monuments of the Middle Ages. Finally, the fourteenth-century Scaligeri Palace, with its tall campanile and the exquisitely sculptured family tombs, recalls the tyranny of the della Scalas (1260-1375). A walled city and a stronghold in Rom. times, V. was fortified with its present circle of forts during the Austrian occupation (1797-1866), being then part of the great Quadri-

lateral. It has numerous manufs., and trades in wines, fruit, and marble. In the Second World War the city sustained considerable injury from bombing and finally from blast when the Gers., before departing, blew up all the bridges (April 25, 1945). Pop. 154,000; (prov.), 647,400. See F. S. Maiffei, *Verona Illustrata*, 1731; A. Wiel, *Verona* (Med. Town Series), 1902; A. M. Allen, *A History of Verona*, 1925.

**Veronal**, known chemically as diethyl barbituric acid,



is a widely used hypnotic or sleep-producing drug. It is not very poisonous, though the sensibility of individuals towards it varies considerably, and it should be taken only under medical supervision. It is prepared by acting upon urea (q.v.) with diethylmalonic ester.

**Veronese, Paul**, whose real name was **Paolo Caliari or Cagliari** (1528-88), It. painter, b. at Verona. He studied under Antonio Badile, and from 1555 lived in Venice. His gigantic paintings, including his religious works, exhibit rich colouring, broad composition, and that love of pomp and worldly splendour which led to charges of irreligion against him. The huge 'Marriage at Cana,' now in the Louvre, is typical of the exuberance of his art. Apart from the fine 'Vision of St. Helena' and the 'Family of Darius' (National Gallery, London), his best paintings and frescoes are in the church of San Sebastiano and the Villa Masiera (Venice). See F. P. Stearns, *Four Great Venetians*, 1901; and P. H. Osmond, *Paolo Veronese: his Career and Work*, 1927.

**Veronica**, St., name given to the woman whom tradition speaks of as having wiped our Lord's face with a kerchief on the road to Calvary. A picture of Christ's face remained imprinted on the kerchief.

**Veronica**, or **Speedwell**, genus of herbs or shrubs, of the family Scrophulariaceae. The common Brit. meadow-speedwell is a small herb, with bluish-mauve flowers; there are sev. shrub varieties in New Zealand and Australia.

**Verrocchio, Andrea del** (1435-88), real name Cione. It. artist, was 'goldsmith, master of perspective, sculptor, carver, painter, and musician' according to Vasari. He worked under Donatello, and Leonardo da Vinci was his pupil. The only authentic painting of his is the somewhat hard but forcible 'Baptism of Christ,' at Florence. His renown has a sure foundation in the magnificent equestrian statue in bronze of Bartolommeo Colleoni, which adorns a piazza of Venice. See H. Mackowsky, *Verrocchio*, 1901; M. Cruttwell, *Verrocchio*, 1904.

**Versailles**, cap. of the dept. of Seine-et-Oise, about 10 m. S.W. of Paris, France, notable on account of its palace. This consisted originally of a château, erected by Louis XIII. In 1670 Louis XIV. decided to augment the building, and commissioned the architect Le Van, who was succeeded by Mansart, who in turn was followed by De Cotte; while the gardens were designed by Le Nôtre, and the decoration of the interior was super-

vised by Le Brun. Louis XV. lived frequently at the palace, and since then it has been the scene of many historic events. Here, in 1783, Britain recognised the independence of her Amer. colonies, while it was here in 1871 that the capitulation of Paris was signed. The V. Treaty (q.v.) of 1919 was signed here. Prior to this V. had been turned into a public museum, and it contains many pictures done in Napoleon's time. See P. de Nolhac, *Versailles et la cour de France* (10 vols.), 1925-30; G. Lenôtre, *Versailles au temps des rois*, 1934.

**Versailles, Treaty of** (1919), signed on June 28, 1919, and ratified Jan. 10, 1920. (For the hist. of the conference which discussed the terms of peace following the termination of hostilities in the First World War see PEACE CONFERENCE (1919).) The plenipotentiaries of the Allied and Associated Powers met in Jan. 1919 at Versailles to draw up the conditions of peace for the defeated Central Empires. These Powers were the United Kingdom (represented by D. Lloyd George, A. Bonar Law, Viscount Milner, A. J. Balfour, and G. N. Barnes); U.S.A. (Woodrow Wilson and Robert Lansing); France (Georges Clemenceau); Italy



Alinari

#### JESUS AND ST. THOMAS

Sculpture by Verrocchio, set in a Tabernacle by Donatello in the Oratorio S. Michele, Florence.

(V. E. Orlando); and Japan (Marquis Saionji). The Brit. Overseas Dominions were also represented by: Canada (Sir G. Foster and C. J. Doherty); Australia



(W. M. Hughes and Sir J. Cook); S. Africa (General Botha and General Smuts); and New Zealand (W. F. Massey). The minor Allied states represented were Belgium, Brazil, China, Greece, Poland, Portugal, Rumania, Yugoslavia (then known as Serbo-Croatia) and Czechoslovakia, besides various Central and S. Amer. states and others; and of these China alone refused to sign the treaty. The draft was presented to the Ger. delegates on May 7; on June 22 the Ger. National Assembly at Weimar by a majority of 99 (237 against 138) voted in favour of acceptance, and on June 28 the Ger. plenipotentiaries signed the treaty at Versailles. The original copy is deposited in the archives of the Fr. Republic.

**ARTICLES OF THE TREATY.** *The League of Nations.*—In the forefront of the treaty were the clauses to establish the League of Nations and to provide for international action to preserve peace in the future by means of the Covenant of the League (see COVENANT OF THE LEAGUE OF NATIONS, LEAGUE OF NATIONS; see also INTERNATIONAL JUSTICE, PERMANENT COURT OF). The Monroe Doctrine (*q.v.*) is expressly excluded from the decisions of the League members. Provision is also made in these earlier articles for the administration of the ceded Ger. colonies and ter. by mandatories of the League (see MANDATORY SYSTEM).

*Surrendered Territories.*—(i.) Alsace-Lorraine to France; (ii.) the greater part of the provs. of W. Prussia and Posen to Poland; (iii.) the greater part of E. Silesia and of E. Prussia to Poland; (iv.) a portion of Upper Silesia to Czechoslovakia; (v.) Memel to Lithuania; (vi.) Danzig, to be a Free State under the protection of the League of Nations; (vii.) part of Schleswig to Denmark (see also SELF-DETERMINATION). Provision was also made to settle the ultimate destiny of the following areas by plebiscite (*q.v.*): (i.) The Saar Basin (after fifteen years); (ii.) Schleswig (in two zones); (iii.) dists. in S.-E. Prussia, in W. Prussia, and in Upper Silesia. In 1920 and 1921 the plebiscites resulted as follows: Eupen and Malmedy dists. to Belgium; the N. zone of Schleswig to Denmark, and the S. zone for Germany; E. and W. Prussia for Germany, and Upper Silesia for Germany; but notwithstanding the decision in Upper Silesia, some 1240 sq. m., with a pop. of over 890,000, was transferred to Poland. The total area in Europe lost to Germany under the treaty was about 27,250 sq. m. with a pop. of 1,675,640. The ceded Ger. colonial empire comprised S.-W. Africa, surrendered to the Union of S. Africa; E. Africa to Great Britain and Belgium; the Cameroons to Great Britain and France; Togoland to Great Britain and France; the Pacific Is. to Great Britain and Japan; and Kiochow to Japan. The total area of the ceded Ger. colonial empire was 1,128,000 sq. m., with a pop. of over 13 millions. Germany also renounced her rights in China, Liberia, and Morocco and recognised certain treaties, etc., referring to Siam, Egypt, Turkey and Bulgaria.

*Military and Naval Clauses.*—These were designed for the dual purpose of compelling compliance with the terms of the treaty and of securing Ger. disarmament. The Ger. Rhineland W. of the riv., together with the bridgeheads of Köln, Koblenz, Mainz, and Kehl, were to be held by Allied troops for fifteen years, with progressive evacuation at earlier dates as and when the treaty conditions were fulfilled, particularly those as to reparations and disarmament (the Rhineland was prematurely evacuated in 1930). Germany also undertook not to construct fortifications or maintain armed forces W. of a line drawn 32 m. E. of the Rhine (see also COLOGNE). Compulsory military service in Germany was abolished and the Ger. *Reichswehr* (regular army) was to be reduced to a maximum of 100,000 effectives. A limitation was put on the manuf. in Germany of armaments and of war material, and the making of poison gas, tanks, and armoured cars and the importation of munitions were prohibited. The fortifications of Heligoland and all works commanding the routes between the N. Sea and the Baltic were to be demolished. The entire Ger. navy (with the exception of 6 battleships of the *Deutschland* class, 6 light cruisers, and 12 destroyers and 12 torpedo boats) was to be surrendered (Germany had previously surrendered the bulk of her navy off Rosyth, and these were, for the most part, scuttled by their crews at Scapa Flow), and Germany was also prohibited from retaining or building any submarines. No new warships were to be built except of a fixed small displacement, 10,000 tons for battleships and 6000 tons for light cruisers. The total strength of the Ger. navy was limited to 15,000 men. Special clauses were framed to prevent training of large numbers of men in the forces and, similarly, the military training of police was prohibited. Further, Germany was forbidden to maintain military or naval air forces or to possess any dirigibles (or Zeppelins); but as she was not forbidden to possess commercial aeroplanes (after the lapse of six months) these could be (and were) easily converted into bombing machines. For some years a control was exercised by Commissions of Control over Germany's munitions output, recruiting machinery and the like matters, a task which was of necessity beset with difficulties.

*War-Guilt.*—Under the treaty, the Allies publicly arraigned the ex-Empress William II. (who had fled to Holland) for a supreme offence against international morality and the sanctity of peace and made provision for a special tribunal to try him. But, in fact the Dutch Gov. could not and were not even expected to surrender their refugee, the ex-Kaiser.

*Reparations.*—Germany accepted, under the treaty, responsibility for the loss and damage caused to the Allies by the War, and provision was made for assessing the amount of compensation to be paid by Germany in kind or money. Under the Financial Clauses the first charge upon the assets and revenues of the

Ger. Empire was to be reparations, and up to May 1, 1921, Germany was forbidden to dispose of or export gold without the approval of the Reparation Commission (see DAWES PLAN; REPARATIONS; and YOUNG PLAN).

**Miscellaneous.**—There were also provisions relating to labour organisation, trade, and economic conditions; aerial navigation; ports and waterways; Ger. property in Allied countries was to be applied to meeting the claims of Allied citizens for debts or losses due to Ger. agency, war graves, etc. The whole treaty contains some 440 Articles, and the authentic text was presented to Parliament as Treaty Series No. 4 (1919). Cmd. 153. Alterations of the treaty in respect of the occupation of the Rhineland and reparations were effected by negotiation; the rest of the treaty was abrogated by Hitler by unilateral action. See also *under* EUROPE. See Index to the Treaty of Peace between Allied and Associated Powers and Germany; E. J. Dillon, *The Peace Conference*, 1919; H. Nicolson, *Peacemaking*, 1919, 1933; H. W. V. Temperley, *History of the Peace Conference*, 1920–24; G. P. Gooch, *Studies in Diplomacy and Statecraft*, vol. 6, 1942; H. McCallum, *Public Opinion and the Last Peace*, 1944; and D. P. Myers, *The Treaty of Versailles and After*, 1947.

**Verse**, concourse of words so arranged as to give a metrical or rhythmical effect. 'V.' is figuratively derived from the turning of the plough (from *vertere*, to turn), which produces a line or furrow. A V. is strictly 'a series of rhythmical syllables, divided by pauses and destined in script to occupy a single line.' In Eng. the word 'V.' is loosely used of metrical composition as opposed to prose, and the singular V., as well as the more correct Vs., is used of a collection of sev. lines of poetry. The Gks. and Romans made their versification depend on the way in which long and short syllables succeed one another, that is, on quantity, whereas in modern languages rhythm is dependent on stress or accent. Definite combinations of syllables are called 'feet.' It is a convention in Eng. prosody to use the classical names for the various feet, this being made possible by the assumption that an accented syllable is equivalent to a long syllable, and unaccented to a short one. The best-known feet are the spondee (q.v.), dactyl (q.v.), iamb (q.v.), trochee (q.v.), anapaest (q.v.), and amphibrach (q.v.).

The most common Eng. V. forms are: (a) blank or unrhymed V.; (b) heroic couplet (rhymed); (c) the Spenserian stanza of nine lines closing with an Alexandrine; (d) octosyllabic V.; and (e) the sonnet of fourteen lines which Surrey introduced from Italy. An illustration of (a) is *Hamlet*; of (b) The Prologue to the *Canterbury Tales*; of (c) the *Faerie Queene*; of (d) *Marmion*; whilst Keats and Wordsworth are two of a host of sonneteers (e). See also FREE VERSE.

See J. B. Mayor, *Chapters on English Metre*, 1901; G. Saintsbury, *History of English Prosody*,\* 1906–10; E. Hamer,

*The Metres of English Poetry*, 1930; L. S. Harris, *The Nature of Poetry*, 1931.

**Verat**, Russian linear measure equivalent to 3500 Eng. ft.

**Vertebrates**, or **Backboned Animals**, form a div. of the animal kingdom which includes not only man and animals of similar structure (mammals), but also fishes, amphibians, reptiles, and birds. Vs. are characterised by the possession of a well-developed internal skeleton, and by forming breathing organs from the wall of the throat.

**Vertigo**, or **Giddiness**, a sense of lack of equilibrium. It may be *aural*, connected with ear disturbances; *ocular*, connected with eye disturbances; *cerebral*, caused by disease or injury in the brain; *gastric*, caused by digestive disturbances; or may be due to the introduction of toxic substances, such as alcohol, tobacco, etc., into the blood.

**Verulam**, **Lord**, see BACON, FRANCIS.

**Verulamium**, or **Verolanium**, native Belgic settlement of importance, immediately W. of St. Albans, Hertfordshire, England, founded at the end of the first century B.C. It was sufficiently well developed shortly after A.D. 43 to be awarded the high status of *municipium*, an honour unique in the prov. of Britain. The tn. was sacked by the Iceni under Boadicea (Boudicca), in A.D. 61, but after the turn of the middle of the century, a new tn. of some 150 ac. was laid out. There was a further development in the second quarter of the second century. It decayed much in the third century, but towards its end suffered a temporary reinstatement, only to waste again in the Dark Ages. The excavations in 1930 and the years following threw much light on the Rom. occupation of the S.E. of Britain. Much of the tn. plan was recovered, and the sites of temples, houses, shops, and streets were excavated. Part of the tn. wall, the theatre, and a mosaic still remain in position, but most of the discoveries of note are represented in the well-arranged Museum. Especially important is the extensive series of pottery types, both Rom. and Belgic, and two fine pavements which are re-erected on the Museum wall. The excavations are now filled in. See *Society of Antiquaries Research Report*, No. XI., 1936, and R. L. P. Jowitt, *A Guide to St. Albans, and Verulamium*, new ed., 1948.

**Verus**, **Lucius Aurelius**, joint-emperor of Rome with Marcus Aurelius, his brother by adoption, from A.D. 161 to 169.

**Vervain**, see VERBENA.

**Verviers**, city in Belgium, situated on the R. Vesdre, 13 m. E. of Liège. With its suburb Ensalval, it is one of the chief centres of the woollen industry. The large quantities of water required are supplied by the Gileppe dam, 6 m. to the E. Other manufs. are soap, leather, footwear, chocolate, and chemicals. Pop. 40,600.

**Vesicant**, see BLISTER.

**Vespasian**, or **Titus Flavius Sabinus Vespasianus** (A.D. 9–79), Rom. emperor, b. in Reate in the land of the Sabini, his father being a humble tax collector.

He owed his rapid rise undoubtedly to his military genius; in 43, as *legatus legionis* in Britain, he reduced the Isle of Wight. Nero disliked him, but could not dispense with his services, and thus V. was in Judæa, where he had been sent in 66 to conquer the Jews, when tidings reached him of his proclamation as emperor (69). Vitellius, his rival for imperial honours, was defeated by Antonius Primus, and, largely owing to the support of Mucianus, V. was soon firmly established on the throne. See also *ROMAN HISTORY*. See B. W. Henderson, *Five Roman Emperors*, 1927; and C. Longford, *Vespasian and some of his Contemporaries*, 1928.

*Vespers*, see under *BREVIARY*.

*Vespers*, the *Sicilian*, see under *SICILY*.

**Vespucci, Amerigo** (1451-1512). It. navigator, b. in Florence. He began his career at Seville as a merchant, but his interest in the exploits of Columbus induced him to abandon this profession, and he set sail for the New World in 1499.

The first discovery of the mainland of America, at Paria, was made by Columbus in the course of his third voyage in 1498. In 1499, Alonso de Ojeda, having on board V., reached a point further S., somewhere, it is conjectured, on the coast of Surinam and thence went northwards to the gulf of Paria; after that to Venezuela which he so named. V.'s account of the natives of Venezuela is 'curious and interesting' and his narrative, spreading over Europe, was the cause of his name being given to the third part of the inhabitable globe. See *letters of Vespucci*, trans. for the Hakluyt Soc. by C. R. Markham, 1894; *Vespucci Reprints*, 1916; and F. J. Pohl, *Amerigo Vespucci: Pilot Major*, 1945.

**Vesta**, Rom. goddess of the hearth, corresponding to the Gk. goddess 'Hestia' (*q.v.*). From Lavinium whither Æneas had brought, from Troy, the sacred fire of V. as well as the Penates, her worship was introduced to Rome by Numa, and he erected her central place of worship in the Forum between the Palatine and Capitoline hills. In this shrine her fires were kept burning by the Vestals (*q.v.*), her virgin priestesses. The 'Vestalia' was celebrated on June 8.

**Vesta**, minor planet discovered in 1807 by Olbers of Bremen, was the fourth in order of discovery, and is the brightest, being the only one visible to the naked eye, and as bright as a 6th magnitude star. It has the greatest albedo, and a diameter of c. 250 m. (Bamond), 214 m. (Farley). Revolution is performed in 3.63 years at a mean distance of 219 million m.

**Vest-Agder**, co., of Norway on the N. Sea, known until 1919 as Lister and Mandal. The cap. is Christiansand. Area 2793 sq. m. Pop. 199,000.

**Vestals**, *The*, or *Virgines Vestales*, the six priestesses of Vesta (*q.v.*), who maintained the ritual and worship of that goddess in her temple at Rome. They were chosen by lot from a list of twenty maidens of free and worthy parentage, selected by the pontifex. Their term of

service was at least thirty years; the years of learning and initiation, ten years of actual ministrations, and ten years for imparting their lore to neophytes. The violation of the vow of chastity was punishable by death, whilst retribution followed if any virgin allowed the sacred fires to go out.

*Vesteras*, see *VÄSTERAS*.

*Vesterbotten*, see *VÄSTERBOTTEN*.

*Vesternorrland*, see *VÄSTERNORRLAND*.

**Vestfold**, co. of Norway, on the W. side of Oslo fjord, known formerly as *Jarlsberg* and *Larvik*. The cap. is Larvik. Area 903 sq. m. Pop. 145,000.

*Vestmanland*, see *VÄSTMÄNLAND*.

**Vestments, Sacred**, have been worn by the priesthood from time immemorial. The regulations with regard to those of the Jewish priests were extremely minute, but in spite of apparent resemblances no connection can be traced between these and the Christian V. The Mass V. for a priest in the W. Church are amice, alb, girdle, stole, maniple, chasuble. At other solemn services and in processions a cope is used. At choir offices and other occasions the clergy wear a surplice, sometimes in the Eng. Church with the addition of a scarf and univ. hood. A stole is worn in the administration of the sacraments. The garments in the Gk. Church differ somewhat from these. See H. Norris, *Church Vestments*, 1949.

**Vestry**, that part of a par. church in which the vestments and other movable ornaments are kept. Since such parts of the church have generally been used for parochial meetings, these, duly convened, have also acquired the name of *Vs.* It is the duty of *Vs.* to provide funds for the maintenance of the office of the church, and the due administration of public worship, and to elect churchwardens. Their conduct is regulated by common law and by a succession of Acts.

*Vesuvian*, see *IDOCRAE*.

**Vesuvius**, volcano, 7½ m. E.S.E. of Naples, rising from the E. shores of the Bay of Naples, Italy. Its height varies by a few hundred ft., but averages 4000 ft. Monte Somma, the Mons Summanus of the ancients, is a great semicircular girdle of cliff to N. and E., parted from the eruptive cone by the valley known as Atrio di Cavallo, and itself the remnant of a massive wall which once shut in the huge cone of prehistoric times. Lava, scoriae, ashes, and pumice-stone are the fabrics of the mt., which during activity emits a large assortment of minerals, such as augite, magnetic iron, leucite, hornblende, and mica. The amazing fertility of its slopes, on which especially those grapes luxuriate from which the wine 'Lachrymæ Christi' is made, explains why for over twenty-five centuries V., in spite of its constant menace, has been the heart of a densely populated region. The destruction on Aug. 24, A.D. 79, of the cities of Pompeii, Herculaneum, and Stabiae, the death of the elder Pliny, have cast an unfading glamour over that historic eruption. During those of 472 and 1631 particles of dust are said to have alighted in Constantinople. During that

of 512 some may have reached Tripoli. Other years of remarkable activity were 1794, 1822, 1855, 1871, 1906, 1929, and 1944, the volcano never having been totally quiescent since A.D. 79. See F. A. Perrott, *Vesuvius Eruption of 1906*, 1924; and G. Alfano and J. Friedlaender, *Die Geschichte des Vesuvius*, 1929.

**Vetch**, see TARE.

**Veterinary Science** may be said to have begun in the Egyptian civilisation, and from the Egyptian knowledge of the horse and its diseases the Gks. and Roms. learnt much. The Rom. Vegetius (c. A.D. 300) left writings on the subject, which in the sixteenth century were much studied, and stimulated interest in the science, especially in France, where the first veterinary college was estab. at Lyons in 1762, and the second at Alfort near Paris in 1766. A Frenchman, St. Bel, founded the Royal Veterinary College in London in 1790, and Liantard first estab. a college in New York.

Veterinary education in Great Britain and Ireland is provided by the univs. of Bristol, Cambridge, Glasgow, Liverpool, and London, also the veterinary colleges of Edinburgh and Dublin. Provision is now made in the Veterinary Surgeons Act of 1948, for the absorption of the college at Edinburgh by the appropriate univ. of that city. The licence to practise as a veterinary surgeon (M.R.(C.V.S.)) is obtained on success in a series of examinations conducted by the Royal College of Veterinary Surgeons. There is at present (1950) no other qualification which entitles an individual to practise veterinary medicine and surgery and describe himself or herself as a veterinary surgeon, and the Veterinary Surgeons Act of 1948 provides that registration with the Royal College of Veterinary Surgeons will be *a sine qua non* of practice as a veterinary surgeon in the future. This Act provides that the Royal College of Veterinary Surgeons will continue to examine candidates for the M.R.(C.V.S.) diploma, and for the higher qualification, the F.R.(C.V.S.) diploma. Univ. degrees in V. S. will vary in exact title but are likely to be those of Bachelor, Master, and Doctor; e.g. the Univ. of Liverpool confers the B.V.Sc., M.V.Sc., and D.V.Sc.

In modern times the most important function of the veterinary profession is the improvement of animal husbandry in all its aspects. This involves a knowledge of the proper selection of breeding farm animals, the management and feeding of herds and flocks and the prevention of diseases. Recognition of disease in the interest of public health is of primary importance and diseases of animals communicable to man by contact or through the medium of milk or meat must without delay be recognised by the veterinarian and measures applied with a view to eliminating danger to man and spread to other animals. Research institutes of the Ministry of Agriculture and appropriate depts. of veterinary schools play an essential part in the recognition and prevention of animal disease. There is an increasing demand in the colonies for

Veterinary Scientists to combat infectious diseases, especially rinderpest, which have devastated herds and caused large tracts of country to be uninhabitable. In private practice the veterinary surgeon, apart from the part-time duties of many as officials of the Ministry of Agriculture, is called upon to attend cases of animal suffering of all kinds. Small animal practice has assumed an increasing importance during the last half century and some veterinary surgeons, particularly women, are almost wholly engaged in it. Great strides have been made in this kind of practice particularly in respect of anaesthesia operative technique, X-ray diagnosis, preventive medicine and euthanasia. Veterinary Surgeons are also employed by the Royal Army Veterinary Corps, by some municipalities and animal welfare societies.

**Veto**, term applied to the right of a king or other chief magistrate or officer to withhold his assent to the enactment of a law, or, generally, of one branch of the executive or legislature of a state to reject the bills, resolutions, or measures of other branches. The term originates in the power of the tribunes of the plebs of ant. Rome to declare their protest against any unlawful measure, which they did by pronouncing the word 'veto' (I forbid). In Great Britain the power theoretically belongs to the crown (see CROWN). In the crown colonies the governor exercises the power (see COLONIAL GOVERNOR). In the Brit. Overseas Dominions, the V. of the governor-general had fallen into desuetude even before the passing of the Statute of Westminster, 1931, and even before the status of the governor-general and of the state governor had been changed by the Imperial Conference (see on this COLONIAL GOVERNOR; COLONIAL LAW). The position now (1950) is that the governor-general of a Dominion or the governor of a state is merely the king's representative and has no power of reservation or, in other words, no power to V. a measure for 'repugnancy' within the meaning of the Colonial Laws Validity Act, 1865. The governor of an Australian state, however, has the right, in effect, to V. a measure which violates the written constitution of the State. See also WEST-MINSTER, STATUTE OF. The power of V. enjoyed by the House of Lords was reduced by the 1911 Parliament Act to two years, and by an Act of 1949 to one year. In the U.S.A., the president can V. a measure of Congress, but, notwithstanding his V., the measure becomes law if subsequently carried by a two-thirds majority of each house.

The Great Power V. has been the great problem of the United Nations; it nearly wrecked the San Francisco Conference (q.v.); for the Soviet formula had required that the five Great Powers must always be in agreement. Russia has exercised its right to stop majority decisions on numerous occasions. This is the great stumbling block to the practical functioning of the Council. (See UNITED NATIONS, CHARTER OF THE). See W. Koo, *Voting Procedures in International Political Orga-*

*nisations*, 1947; and M. Maier, *Le veto législatif du Chef de l'État*, 1948.

**Vetter**, see VÄTTER.

**Veurne**, see VERNES.

**Veuster, Joseph de**, see DAMIEN, FATHER.

**Vevey**, tourist resort in the canton of Vaud (Waadt), Switzerland, situated on Lake Geneva. One of the chief buildings of interest is the church of St. Martin, in which is Ludlow's tomb. V. is also the scene of Rousseau's *Nouvelle Héloïse*. The chief manufs. are chocolate, macinery, watches, and infants' food. Pop. about 14,100.

**Vexatious Indictments Act (1859)**. The object of this Act was to prevent undue prosecutions, by putting a check on the former unlimited right of private persons to prefer an indictment to a grand jury without any previous enquiry before justices in the police court under the Indictable Offences Act, 1848. The effect was that for specified misdemeanours, viz. perjury, subornation, conspiracy, false pretences, keeping a gambling house or disorderly house, indecent assault, misdemeanours under the Debtors Act, 1869, newspaper libels, misdemeanours under the Criminal Law Amendment Act 1885, prosecutions under the Merchandise Marks Act 1887, and misdemeanours under the Children and Young Persons Act, 1933, no indictment could be laid before a grand jury unless (a) the prosecutor had been bound over by justices to prosecute or (b) the accused had been committed by justices to take his trial or (c) the indictment was by direction of the attorney-general or (d) the indictment was for perjury and was by direction of a court, judge or public functionary, authorised to direct such a prosecution. By an Act of 1867, if the prosecutor elects to be bound over to prosecute (which he may do if the justices decline to commit), he may be condemned in costs unless he gets a conviction. The Act of 1859 was repealed by the Administration of Justice (Miscell. Provs.) Act 1933 which (*inter alia*) abolished grand juries and amended the law as to the presentation of indictments. While, however, the Act of 1859 then ceased to have effect, nothing in the Act of 1933 affects any enactment restricting the right to prosecute in particular classes of case.

**Vexilla Regis**, see HYMNS—*Latin Hymnology*.

**Vexillatio**, see under ROMAN ARMY.

**Vexillum**, see under ROMAN ARMY.

**Vexin**, The, historic dist. in the N.W. of the dept. of Seine-et-Oise, France, rising to an altitude of nearly 700 ft. Its possession was once important for the defence of Normandy and it figured conspicuously in the relations between the Fr., Norman, and Eng. kings between the eleventh and fifteenth centuries. In the twelfth-century struggles between the houses of Blois and Anjou, in which the Eng. under Henry II. became involved, Norman V., as it then was, was the strategic key to Rouen. Geoffrey of Anjou (father of Henry II.) under whom Anjou and Normandy became united when

Geoffrey was acknowledged duke of Normandy in 1144, had ceded the V. to the king of France, but Henry regained it by treaty with Louis VII. John (later king of England) alienated the V. in 1195 to Philip II. of France, and Richard Cœur de Lion had to build the fortress of Gaillard on the is. of Andelys on the Seine to replace the lost fortress and natural defences of the Norman V. See F. M. Powicke, *The Loss of Normandy*, 1189–1204, 1913.

**Veygoux**, Louis Charles Antoine Desaix de (1768–1800), Fr. general, b. at the Château d'Ayat, near Niom, and educated at the military school founded by the Marshal d'Effiat. V. played a good part in Moreau's skilful retreat through the Black Forest, drove back the archduke Charles at Rastadt, and for two months held the bridge of Kehl against his assailants. But the subjugation of Upper Egypt during Napoleon's campaign (1798–1799) was the crowning distinction of his career. He died of wounds received at the battle of Marengo.

**Vézelay**, vil. in the dept. of Yonne, France, on the R. Cure, in mediæval times a populous city. It is noted for its beautiful twelfth-century abbey church of St. Madeleine, a major example of the Burgundian-Rom. style. Pop. 6000.

**Viadana**, Lodovico, or Lodovico Grossi (c. 1565–1645), It. composer, b. at Viadana. After entering a religious order he held the post of choirmaster at Fano, Venice, and Mantua. He is usually considered to be the inventor of the *basso continuo*. See life by A. Parazzi, 1876.

**Viadrus**, see ODER.

**Viaduct**, see BRIDGE.

**Via Appia**, see APPIA VIA.

**Via Flaminis**, see FLAMINIAN WAY.

**Viana do Castelo**: 1. Dist. of Portugal, with an Atlantic seaboard, in Entre Minho e Douro. Salmon, tunny, and sardine fishing is carried on. Area 2108 sq. m. Pop. 258,600. 2. Cap. of the above, a port 45 m. N.W. of Oporto. Pop. 11,000.

**Viareggio**, seaport of Tuscany, Italy. It is a favourite resort and has ship-building yards and a school of navigation. Shelley was drowned, and cremated, at V. Pop. 41,400.

**Viatica**, see KIROV.

**Viaud**, Louis Marie Julien, see LOTT, PIERRE.

**Viborg**, see VIHURI.

**Vibrations**, see under MASSAGE.

**Vibrio**, generic term for certain bacteria of spiral form.

**Viburnum**, genus of deciduous and evergreen shrubs and trees (family Caprifoliaceæ) *V. opulus*, the guelder rose, is an ornamental Brit. shrub, with large white flower heads followed by pinkish berries which are eaten in parts of Europe. *V. tinus* is the Lauristinus. *V. lantana* is the Wayfaring tree.

**Vicar** and **Vicarage**. A vicar is one who holds a benefice as deputy of the rector, who may be a layman. The rector, therefore, receives a share of the emoluments of the incumbency. The position occupied by the vicar is sometimes called a vicarage, but this term is

more frequently applied to the vicar's residence.

**Vice-Admiralty Courts.** These are colonial courts exercising nearly the same jurisdiction as the High Court of Admiralty in England; but they are not courts of record (*see* RECORD). Such courts are estab. by the Admiralty by commission under the Great Seal, and may be abolished in the same manner. The jurisdiction of V.-A. C. having a representative legislation extends only to questions respecting prize, the Foreign Enlistment Act, the navy, the slave trade, international law, and treaties or conventions. An appeal from decisions of these courts lies to the Judicial Committee of the Privy Council.

**Vicente**, or **Vincente**, Gil (c. 1470–c. 1540), Portuguese dramatist, *b.* in Lisbon. His plays are divided into autos, comedies, *tragi-comedies*; and *farces* which are full of *vivacity* and merry humour, and undoubtedly contain V.'s best work. Lope de Vega modelled his dramas on G.'s work.

**See Four Plays** (1920) and *Igryes* (1921), trans. by A. F. G. Bell. *See also* studies by A. F. G. Bell, 1921; A. J. Saraiva, 1943; A. B. Freire (2nd ed.), 1947.

**Vicentino**, Ludovico degli Arrighi surnamed (*d.* 1527?), prince of calligraphers, *b.* at Vicenza. V. became writing-master in Venice before going to the Vatican as *scrittore de brevi apostolici*—apostolic brief writer. In 1522 he pub. the first manual of our written alphabet, *La Opera di imparare di scrivere littera Cancellarescha*, which remains unsurpassed. Compressed into twenty pages, it is the fullest writing instruction known. In 1523 V. left Vatican service to produce in Venice his *Il modo de temperare le penne*, describing himself on one page as public notary. This work opens with five pages of the earliest use of calligraphic italic type which V. did not use again and has no further record. Returning to Rome, V. took up printing, the first off his press being the *Corymbus*, ed. by Blosius Palladius, Papal Secretary. His partner and punch-cutter was Lautizio de Bartolomeo del Rotelli, a Perugian goldsmith. By 1524 he was printing for the humanist poet Gian Giorgio Trissino—first to write blank-verse plays—who said of him, 'as in calligraphy he has surpassed all other men of our age, so . . . he has gone beyond all other printers,' a tribute given modern confirmation by Caslon, Garamond, and others in their discipleship. Other printing included four books (1526).

without the aid of Lautizio, yet no example of V.'s holograph as *scrittore* can be found.

*See Il modo de temperare le Penne*, two eds. Victoria and Albert Museum, London; F. Warde's complete facsimile of *La Opera di* and *Il modo*, introduced by S. Morison, 1926; P. Standard, *Calligraphy's Flowering, Decay, & Restoration*, 1947; and A. Fairbank, *A Book of Scripts*, 1949. On development of italic hand to printing, *see* S. Morison, *Type Designs of the Past and Present*, 1926.

**Vicenza**, cap. of V. prov., Venetia, Italy, at the confluence of the Retrone and the Bacchiglione, 41 m. N.W. of Venice by rail; it manufs. silk and woollen goods, leather, pottery, and musical instruments. Many of the buildings were designed by Palladio (*d.* 1580), a native of V. The Gothic cathedral dated from the thirteenth century. Pop. 78,100. The dist. of Sette Comuni in the N. of the prov. consists of Asiago, Enego, Foza, Gallio, Lusiana, Roana, and Rotzo, whose

*Segue lo esempio delle bre che pòno  
ligarsi con tutte le sue sequenti, in tal mo-  
do cioè  
aa ab ac ad ae af ag ah ai ak al am an  
ao ap ag ar as af at au ax ay az*

FIVE CURSIVE LETTERS OF ARRIGHI VICENTINO  
From *La Opera*, in the possession of Mr. R. B. Fishenden

inhab. speak a Ger. patois. V. suffered heavily in the Second World War, the cathedral being among the buildings destroyed. Area of prov. 1048 sq. m. Pop. 621,300. Pop. of tn. 78,100.

**Vice-President**, next in rank to a president. As a rule the duties of a V.-P. are necessarily nominal or dormant. In the U.S.A. the V.-P. automatically becomes president on the demise of the president during the latter's term of office. His chief duty is as presiding officer over the U.S. Senate, in which, however, he has only a casting vote. He has no seat in the cabinet.

**Viceroy**, one who rules over a kingdom or country in the name of the king with royal authority. The title so far as Great Britain is concerned seems to be confined in recent hist. to the former Vs. of India.

**Vichy-les-Bains** (Lat. *Aquæ Calidæ*), tn. of the dept. of Allier, France, on the Allier. It is a famous watering-place and its springs were known to the Romans.

V. is, however, now chiefly remembered as a synonym for the Fr. defeatist gov. of Pétain (*q.v.*), and Laval (*q.v.*), formed in 1940. Pop. 29,400.

**Vicia**, see TARE.

**Vicious Intromission**, see INTROMISSION.

**Vickers**. Vickers Ltd. originated in 1828 when Edward Vickers went into partnership with his father-in-law, George Naylor, under the title of Naylor, V. & Co., and started crucible steel works and rolling mills at Millsands in Sheffield and Wadsley. They later took up the manuf. of steel castings and steel railway tyres, and in the early sixties larger works were erected at Sheffield (the R. Don Works), which formed the beginning of the existing works of English Steel Corporation. On April 17, 1867, V. Sons & Co., Ltd. was formed with a capital of £155,000 to take over the business of Naylor, Vickers & Co. The authorised capital in 1950 was £26,500,000 of which £20,679,391 had been issued.

Plant for the construction of guns and armour was laid down in 1888. In 1928 the armament, shipbuilding, and certain commercial interests were merged with like interests of Sir W. G. Armstrong Whitworth & Co. Ltd. and a new company was formed for this purpose under the style of V.-Armstrongs, Ltd. In 1938 the aviation interests of V. were transferred to the new company.

V. Ltd., is now a holding company owning *inter alia* all the shares in Vickers-Armstrongs, Ltd., and jointly with Cammell Laird & Co., Ltd., the whole of the issued capitals of English Steel and Metropolitan-Cammell. The interests of the Vickers Group cover a very wide range including shipbuilding and repairs, aircraft, steel production, engineers' tools, equipment for power stations, docks and harbours, mining, and cement-making plant, printing machinery, power presses, soap, paint, and ink-making machines, non-ferrous products, brewing, malling and distillery plant, optical and scientific instruments, rubber and plastic products, railway rolling stock, motor-bus bodies. They have interests in Australia, S. Africa, India, and Pakistan. The head office is Vickers House, Broadway, Westminster, London, S.W.1.

**Vickers Test**, see METALLURGY (METAL TESTING).

**Vicksburg**, co. seat of Warren co., Mississippi, U.S.A. It is an important cotton manufacturing centre and has also railroad shops, saw and lumber mills, canneries, and machinery works. The scene of an important siege and campaign of the Civil war, it contains National Cemetery with more than 12,000 graves of unidentified soldiers, and the V. National Park of 1300 ac. on the site of the great battle-ground of 1863. Pop. 24,500.

**Victor**, name of three popes and two antipopes. *Victor I.* *Saint*, was pope from c. 189 to c. 199. He may have been *b.* in Africa. He decided the Easter controversy by ordering all churches to celebrate Easter Day on a Sunday, and is said to have originated the use of Lat. in the

Liturgy. *Victor II.* (*Gerhard of Eichstatt*), pope 1053-57, was a German. He vigorously asserted the independence of the papacy against the Imperial claims. *Victor III.* *Saint* (*Dauferius* or *Desiderius*), pope May-Sept. 1087, was *b.* at Benevento. He became abbot of the Benedictine monastery of Monte Cassino in 1057, and under him the abbey enjoyed its greatest distinction, both in sanctity and learning. *Victor IV.* (*Gregory Conti*), antipope March-May, 1138, was the nominee of Roger of Sicily, and reigned in opposition to Innocent II. *Victor IV.* or *V.* (*Octavian of Tusculum*), antipope 1159-64, was supported by the Romans and the Emperor against Alexander III.

**Victor, Perrin Claude, Duke of Belluno** (1764-1841), Fr. marshal, *b.* at La Marche (Vosges). He entered the army in 1782, distinguished himself at Toulon (1793). He commanded in the It. campaigns of 1796-97 and 1799-1800, and won distinction at Marengo. He took part in the campaigns in Russia, Germany, and France.

**Victor Amadeus**, see under SAVOY.

**Victor Emmanuel I.** (1759-1824), king of Sardinia (1802-21), *b.* at Turin. He commanded the Sardinian forces against the Fr. (1792-96), who occupied all the continental possessions of his family. The first Peace of Paris (1814) restored to him Piedmont, Savoy, and Nice, and the second (1815) restored Genoa. He abdicated in favour of his brother, Charles Albert, in 1821.

**Victor Emmanuel II.** (1820-78), king of Sardinia (1849-61) and of Italy (1861-78). He ascended the throne on his father's abdication after the defeat at Novara (March 23, 1849). Aided by his ministers, D'Azeglio and Cavour, and later by Garibaldi, a new It. kingdom had been created by the end of 1860, and V. E. proclaimed king of Italy (Feb. 26, 1861). In 1866 he wrested Venetia from Austria, and in 1870 occupied Rome. See also ITALY. See lives by G. Godking, 1879; Sir E. Dicey, 1882, and C. S. Forrester, 1927.

**Victor Emmanuel III.** (1869-1947), king of Italy, *b.* at Naples, only son of the prince of Piedmont, later King Humbert (or Umberto) I. In 1896 he married Princess Elena of Montenegro. There were five children: Crown Prince Umberto who, in 1930, married Princess Marie José of Belgium, and four daughters. He played some part in the entry of Italy in the First World War on the side of the Allies.

After the war, his relations with Mussolini were distant and he continued to direct It. foreign policy in its old course, but in the crisis which brought Mussolini to power, he ignored the advice of his ministers to disperse the Fascists by force and refused to sign the decree of martial law presented by his premier, Signor Facta. After the 'March on Rome' (see under FASCISM; MUSSOLINI) he sent Mussolini a telegram offering him the premiership and thereafter he allowed himself to become the figurehead and spokesman of the Fascist regime. He opposed Italy's entry into the Second World War on

Germany's side and sent the duke of Aosta to try and dissuade Mussolini from leading the nation into war against Italy's former allies. In a stormy meeting Mussolini threatened to depose the Royal House unless they ceased interfering in matters which he claimed to be his sole province. Although throughout the Fascist regime, V. E. was commonly regarded as a mere figurehead, he displayed considerable tenacity. He clung to his throne as titular head of the House of Savoy, and adhered blindly to his dreams of a great new Italy, a new Rom. Empire. Later he tried to save what he could from the ruins. He escaped from Rome on Sept. 8, 1943, and reached S. Italy which was under the protection of the Brit. and Amer. armies. He gave sincere support to Marshal Badoglio (*q.v.*) his new premier, and promised support to the Allies after Italy's surrender in Sept., 1943 (*see ITALY, History*). Reluctantly he ceded his royal powers to his son, Crown Prince Umberto, on June 5, 1944, and he abdicated formally in Umberto's favour on May 9, 1946, in a futile last-minute gesture which his advisers hoped would save the monarchy. After the referendum of June 2, 1946, when the It. people voted for a republic, Umberto followed his father into exile. V. E. d. in Alexandria, Egypt.

**Victoria (Alexandrina Victoria)** (1819–1901), daughter of Edward duke of Kent, fourth son of George III, by Victoria, daughter of the duke of Saxe-Coburg, became queen in 1837. She reigned longer than any previous monarch, proved herself a model for constitutional monarchy, and gave her name to a great period of Eng. history and social life.

Princess Victoria was strictly brought up by her mother; her tutors were chosen by her uncle, Leopold, King of the Belgians. On her accession V. broke at once from the rule of her mother, and with tact and firmness eluded uncle Leopold's attempts to influence policy. She then threw herself with the greatest zest into her new duties. Her confidential friend and adviser was Lord Melbourne, the Prime Minister. She soon showed she had a will of her own. When Melbourne's ministry was defeated, Sir Robert Peel was asked to form a gov. Peel stipulated, however, that the Queen's ladies of the bed-chamber (all members of Whig families) should be dismissed, to which, against all advice, the queen flatly refused to agree. She won, and Melbourne returned to office for another two years. In 1840 V. married her cousin, Prince Albert of Saxe-Coburg-Gotha, and soon came to rely almost wholly on his judgment. Difficult times were to follow: Peel, whom the Queen had grown to like, fell from office, and the Whigs brought in Lord Palmerston, whom Prince Albert disliked and distrusted. The Queen followed his lead, and there was constant friction.

In 1861 Prince Albert d. of typhoid and overwork. For the rest of her life, that is for more than half her reign, V. nursed her tragedy, and though she worked laboriously at affairs of state, refusing to let the prince of Wales relieve her

of any of it, for long she never appeared in public if she could possibly avoid it. Her three great ministers of this long period were Gladstone, who addressed her, as she said, as if she were a public meeting, and whom she detested; Disraeli, who was the perfect courtier, flattering his royal mistress and making difficult affairs of state appear simple and interesting; and Lord Salisbury, the great Conservative leader. In 1877 the Queen was proclaimed Empress of India. In 1887 she held her first Jubilee, to be followed ten years later by the Diamond Jubilee. This last period of her life was a sort of apotheosis, in which she was accepted as the living and apparently immortal symbol of Eng. greatness and Empire.

It is impossible to overstate V.'s influence. She had immense character but no great intellect. As a girl she had received the crown when it was in disrepute. She reigned for sixty-three years, and she left it as a symbol of public honour and the highest private virtue. Her happy family life, her sympathy with simple people, her tragic widowhood and retirement, her great courage (in her old age she sent out the word in the dark days of the Boer war that 'The Queen is not interested in the possibility of defeat'), her glorious return in the evening of life, all caused her to be regarded with great veneration and have given her a place in hist. which nothing can bittle. Though the days of personal royal rule were ended beyond revival, V. refused to abate her remaining constitutional privileges,—amongst them a particular care for foreign policy, and there were repeated battles over Palmerston's habit of taking action first and informing his sovereign afterwards. She demonstrated by example the place which the crown could fill in Eng. political life and as a link of the commonwealth, and estab. a tradition of work and service to the nation.

V.'s letters were ed. by Viscount Esher and G. Buckle (1907–30), and her *Journal of Our Life in the Highlands* by A. Helps (1868). *See* lives and studies by Sir R. R. Holmes, 1897; L. Strachey, 1921; Lord Ponsonby, 1933; E. F. Benson, 1935; and E. Sitwell, 1936, 1948. *See also* T. H. Ward (ed.), *The Reign of Queen Victoria*, 1887; E. Gosse, *Character of Queen Victoria*, 1901; Sir T. Martin, *Queen Victoria as I knew her*, 1908; Lord Esher (ed.), *The Girlhood of Queen Victoria*, 1912; C. Jerrold, *The Early Court of Queen Victoria*, 1912, and *The Married Life of Queen Victoria*, 1912; Sir F. Ponsonby, *Sidelights on Queen Victoria*, 1930; P. Guedalla, *The Queen and Mr. Gladstone, 1845–98*, 1933, and *Idylls of the Queen*, 1937; S. J. Marriott, *Queen Victoria and her Ministers*, 1933; F. Hardie, *Political Influence of Victoria, 1861–1901*, 1935; and Sir G. Arthur, *Concerning Queen Victoria and her Son*, 1943.

**Victoria**, state of the Commonwealth of Australia, in the S. of the continent, between the 34th and 39th parallels of S. latitude and the 141st and 150th meridians of E. longitude. It is bounded



on the N. and N.E. by New S. Wales, from which it is separated by the Murray R., on the W. by S. Australia, and on the S. and S.E. by the S. Ocean, Bass Strait, and the Pacific Ocean. The area is 87,884 sq. m., or only about one-thirty-fourth part of the whole continent, but the pop. according to the census of June 1947 was 2,055,300. According to the same census the pops. of the chief cities were as follows: Melbourne (cap.), 1,226,900; Geelong, 44,600; Ballarat, 40,200; Bendigo, 30,800; and Warrnambool, 10,000.

**Physical Features.**—The State is traversed with more or less regularity throughout its length from E. to W. by a chain of mts and lesser hills, completely dividing it into two parts, and known as the Dividing Range. The streams to the N. of it flow towards the Murray R. and those to the S. towards the sea. The E. part of the range, dividing the Gippsland dist. from that of the Murray, is called the Australian Alps; and that part which separates the co. of Ripon from that of Borung is called the Pyrenees. Snow covers the higher peaks for sev. months of the year. The mountainous country is densely wooded to the summits with fine timber, but the peaks above the winter snow-line are bare or only partially covered with dwarfed trees or shrubs. For some 200 m. from Kilmore eastward the mts. are steep, but have been made accessible by good roads; westward from Kilmore the range rapidly dwindles and, though there are points of considerable height, such as Mt. William and Mt. Macedon, is easily crossed. That portion of the Murray basin commencing at Woolonga and extending in the form of a triangle to a width of 200 m. along the W. boundary of the State is almost flat. The remaining country N. and S. of the Dividing Range and its spurs is undulating and in some parts destitute of timber, in others closely wooded. Besides the main Dividing Range, there are other ranges extending in different parts of the country, some of them being spurs of the main chain. V. has a climate far more congenial to Europeans than any other state in Australia. It is never severely oppressive, except during the prevalence of hot northerly winds; these occur only at infrequent intervals in the summer. Droughts in V. are neither so general nor so continuous as in sev. of the other states, though, in certain dists., serious inconvenience and loss have been experienced at times on account of deficient rainfall. The gov., therefore, promoted national irrigation schemes upon a large scale, and these are now under the administration of the State Rivers and Water Supply Commission. Fruit-growing has been especially facilitated by these systems.

**Production and Industry.**—The main industry is grazing and agriculture, over 7,000,000 acs. being under cultivation in 1946-47. The chief products are wheat (3,501,000 acs.); oats (454,000 acs.); barley (138,000); potatoes and hay (734,000). In 1928-29 there were 42,948 acs. devoted

to the culture of vines, producing about 3,000,000 gallons of wine, and 43,300 tons of raisins and currants. A large area is under orchards, and vegetables, tobacco, hops, and olives are also grown. There is a large dairying industry which is becoming increasingly important. 134,185,000 lb. of butter were produced in 1946-47. V. normally exports about half of her total butter production annually. Live-stock includes 2,060,000 head of cattle, 16,500,000 sheep and over 290,000 pigs. The wool produced in 1946-47 amounted to over 197,076,238 lb., valued at over £18,700,000. There are enormous deposits of brown coal and seams of true coal of good quality are being successfully worked. The chief exports, other than wool and gold, are grain and flour, butter, hides and skins, meats, livestock, leather, milk and cream, and tallow. In 1946-47 exports valued £70,748,000 sterling. There is also a depot trade in wool, tea, textiles, timber, tobacco, and sugar. In 1946-47 there were 10,949 factories, employing 265,757 persons, with an ann. output estimated at £A315,437,000. The chief imports are textiles and apparel, woollens, tea, timber, paper, oils, machinery, and iron. Imports in 1946-47 cost £A67,071,725. Melbourne does over 90 per cent. of the overseas trade; the other principal ports being Geelong, Portland, and Warrnambool. The chief manufs. are: woollens, clothing, etc.; food, drink, and tobacco; bricks, stone and glass work, furniture; rubber goods, drugs and chemicals; tanning and fellingmongering. Hydro-electric power is increasingly used. The great Kiewa project begun in 1937, is scheduled for completion in 1951-55.

**Communications.**—Melbourne is connected with Sydney, Brisbane, Adelaide, and Perth by railway. The railways in V., with the exception of small lines, are all state-owned. The number of m. open for traffic in 1947 was 4,756. In 1947 civil aircraft in V. carrying freight and passengers flew 18,704,000 m. and carried 705,600 passengers.

**Education.**—Education establishments in V. are of four classes; the univ. with five affiliated colleges, for superior education; state schools for primary and secondary education—the system of primary public instruction, which was commenced in 1873, is secular and attendance at school is compulsory for children between the ages of six and fourteen, and state instruction is granted free of cost; registered schools, for primary and secondary education, run by the churches or in private hands; and technical schools, for instruction in the various arts. The Melbourne Univ. was estab. under a special Act of the Victorian Legislature in 1853; affiliated to it are Trinity, Ormond, Queen's, and Newman Colleges, connected with the Church of England, Presbyterian, Methodist, and Rom. Catholic Churches respectively and the Univ. Women's College. There are 28 junior and 32 senior technical schools, the junior being worked in conjunction with the senior; there are also two agric. colleges and a school of horticulture.

**Government.**—The gov. of V. consists of a governor appointed by the crown, a Legislative Council or Upper House of thirty-four members, and an Assembly or Lower House of sixty-five members. The Constitution was estab. by an Act of the Victorian Legislature of 1854. The Adult Suffrage Act of 1908 placed women on an equality with men as electors. A very complete system of local self-gov. exists in V. The municipalities are either cities, tns., bors., or shires. Each dist. is a body corporate with a common seal. In 1948 there were 35 cities, 5 tns., 20 bors., and 137 shires. There is a supreme court with a chief justice and 7 puisne judges; courts of general and petty sessions, co. courts, courts of mines, court of licensing, and children's courts.

**Early History.**—Captain Cook and the officers and crew of the *Endeavour* were, probably, the first Europeans to sight the country, though no landing was attempted. On his report that the E. part of Australia was suitable for colonisation, a party of convicts was sent out in 1788 under Captain Arthur Phillip, R.N., and on the shores of Port Jackson, N. of Botany Bay, Phillip estab. a permanent settlement. Later, Hume and Hovell travelled overland from Sydney, and the outcome of their report was that a convict estab. was founded on W. Port Bay. This settlement was soon abandoned and the first permanent settlement in V. was formed at Portland Bay by Edward Henty, from Van Diemen's Land (Tasmania), who landed on Nov. 19, 1834, and thereafter began agric. and stock-breeding operations and also whaling. Other settlers followed, but no marked development ensued in this vicinity, owing to the want of good land and of safe harbourage. The cap. was founded by two Tasmanian parties, one led by John Batman, who landed on May 29, 1835, the other by John Pascoe Fawkner, who reached the site of Melbourne on Aug. 28, of the same year. Others from the same is. and from Sydney followed, bringing stock with them, and penetrated further into the interior. Among these was Maj. (later Lieut.-Col. Sir) Thomas Mitchell, who was so impressed with the economic potentialities of the country, the greater part of which was still unknown, that he named it Australia Felix. His reports, coupled with the success of the earliest settlers, stimulated the interest of existing Australian settlers and of the mother country, and one immediate result was that large herds of sheep and cattle were driven overland from New S. Wales to occupy the best pasturage land in V., and shiploads of emigrants began to arrive from the United Kingdom. Regular gov. was first estab. under Capt. Wm. Lonsdale, who was sent from Sydney to take control, and landed on Sept. 29, 1839. On March 2, 1840, Sir Richard Bourke, the governor of New S. Wales, visited it and named the cap. Melbourne. Charles La Trobe was appointed superintendent, which title in 1851 was changed to that of lieutenant-governor, when the colony was separated from New S. Wales and named

V. Gold was discovered soon afterwards and led to a further influx of pop., but the ensuing and oppressive mining regulations resulted in rioting on the Ballarat (q.v.) goldfield in 1854. A new Constitution giving responsible gov. to the colony was proclaimed on Nov. 23, 1855. See H. G. Turner, *History of the Colony of Victoria* (2 vols.), 1904; J. W. Gregory, *Geography of Victoria*, 1907; N. L. Hall, *Victoria's Part in the Australian Federation Movement, 1849-1900*, 1931; A. Pratt, *Centenary History of Victoria*, 1934; and *Victoria: the first Century* (Official History of Victoria), 1934; A. J. and J. J. Melutye, *Country Towns of Victoria: a Social Survey*, 1944; and the ann. *Victorian Year Book*.

**Victoria**, cap. of Brit. Columbia, on the S. end of Vancouver Is., overlooking the strait of Juan de Fuca, separated by 82 m. of sea from the city of Vancouver on the mainland. Founded as Fort Camosun (Indian name of the site) by the Hudson's Bay Co., in 1843, and renamed in honour of the young Queen in 1851, it became the cap. when the colonies of Vancouver Is. and Brit. Columbia were united under the latter name in 1866. V.'s dominating architectural feature is the imposing Parliament buildings, attached to which are the prov. reference library and the important prov. museum of natural hist. Victoria College (affiliated with the Univ. of Brit. Columbia), and the Dominion Astrophysical Observatory, one of the largest in the world. ♡ is a residential and tourist centre, but there are nevertheless some industries, including shipbuilding, lumbering, saw-milling, flour-milling, and canning. Pop. (1941), 44,068; with Greater Victoria (est. 1946), 100,000. 2. Seaport shipping coffee, cocoa, etc., and manganese, 400 m. N.E. of Rio de Janeiro, the cap. of Espirito Santo, Brazil. Pop. 21,900.

**Victoria and Albert Museum**, South Kensington, London, originated from the Museum of Manufactures which opened in Marlborough House in 1852. The museum was soon called the 'Art Museum,' and later the 'Museum of Ornamental Art,' its best known title. In 1857, the museum together with the Sheepshanks collection and sev. other collections, were assembled in 'The South Kensington Museum.' The aims of the museum included the 'improvement of the public taste in design,' and the collections included both the fine and applied arts. A competition was held in 1891 for designs of new buildings to accommodate the rapidly growing collections, and this was won by Mr. (later Sir) Aston Webb. Queen Victoria laid the foundation stone in 1899 and renamed the museum the V. & A. The new galleries, housing only the art collections (those concerned with science forming the 'Science Museum') were opened in 1909 by King Edward VII. The museum now consists of eleven depts.: those of Architecture and Sculpture; Ceramics, Engraving, Illustration, and Design; Library; Metalwork; Paintings; Textiles; Woodwork; Indian Section (situated in Imperial Institute Road);

Circulation (dealing with travelling exhibitions, etc.); and Museum Extension Services (for inquiries, photographs, lectures, etc.). Outstations are Bethnal Green Museum, Ham House, Osterley Park, and Apsley House. The galleries are arranged in two groups: the primary collections, intended to illustrate the development of the arts in Europe, and arranged by style and period; and the study collection, arranged by materials, for the use of the scholar and the student. The museum is under the Ministry of Education.

**Victoria City**, chief tn. and port of Hong Kong. It is situated between a range of treeless hills of volcanic rock and the extensive harbour of Hong Kong and extends for upwards of 5 m. along the S. shore of the harbour. A large proportion of V. C., particularly in the central dists., was built in the early days of the colony. The chief industries of V. C. are cotton manufs., sugar, cement, paint, preserved ginger, tobacco and matches, rope works, food canning, rubber goods, electrical and light metal wares. St. John's Cathedral, seat of the diocese of Victoria and S. China, was heavily damaged in the Second World War. The pop. of V., including the Peak, is about 500,000.

**Victoria Cross**, highest Brit. decoration, for 'conspicuous bravery or devotion to the country in the presence of the enemy.' It was founded by Queen Victoria towards the conclusion of the Crimean War (1856) and, until the supply was exhausted, was cast from the metal of Russian guns taken at Sevastopol. It consists of a Maltese cross made of bronze, bearing in the centre the royal crown surmounted by a lion, and with the scroll superscribed 'For Valour.' The winning of the V. C. carries with it a pension of £10 per annum, which can, under special circumstances, be made up to £75. A Royal Warrant of 1920 extends eligibility to women of military nursing services and to civilians of either sex when serving under naval, military, or air authorities.

The number of V. C. awards made during the First World War was 623. Of this number 173 were posthumous awards.

The number of V. C. awards made during the Second World War was 179, of which 82 were posthumous awards.

**Victoria Falls**, The (native name *Mosi-oa-tun-ya*, 'smoke sounds there'), great waterfalls upon the R. Zambesi, in Rhodesia, Central Africa, 900 m. from the sea, discovered by Livingstone in 1855. Above the falls the riv. flows over a level stretch of basalt and is flat and broad, dotted with thickly wooded is. At this point it is some 1860 yds. wide, and then drops over a chasm extending the whole breadth and varying from 250 to nearly 400 ft. Its course is impeded by an opposite wall, nearly as high, the water escaping through a channel of 100 ft. width through the 'Boiling Pot,' into the Grand Cañon, now spanned by a splendid bridge. The V. E. and Transvaal Power Company, formed in 1906, utilises the falls to generate power for the Rand. The max. capacity of the generating

sets is nearly 400,000 h.p., the total quantity of electrical energy delivered to consumers being well over 1500 million units. In 1938 a hydro-electric station, with a capacity of 2,000 k.W., was started up and a supply of electricity was provided for the Livingstone Municipality.

**Victoriahavn**, see NARVIK.

**Victoria, Lake**, or **Victoria Nyanza**, known formerly to the Arabs as **Ukero-we**, largest lake of Africa. Area 26,828 sq. m.; 255 m. long and 155 m. broad; altitude, 3726 ft. The water is highest in July and lowest in Nov., the extreme range being 43 ft. As a freshwater lake it is in size second only to Lake Superior. Lake Victoria is situated on the equator and forms the chief reservoir of the Nile, which leaves the lake at Ripon Falls, at Jinja. The N. part lies in Uganda, the S. in Tanganyika Ter., and a small area in the W. of Kenya Colony. The N.E. shore forms part of the coast line of Kenya, the ports on this section being Kisumu, Mwanji, and Karungu; the N. and N.W. shores form part of the coast line of the Uganda Protectorate, on which the prin. ports are Bukakata, Katobo, Jinja, Entebbe, Kampala, and Port Bell; and the S., S.W., and S.E. shores form part of the coast line of Tanganyika, the chief ports being Bukoba, Mwanza, and Musoma. Kavirondo Bay, Speke Gulf, Mwanza Bay, and Emin Pasha Gulf are the chief inlets. A plan was evolved, in 1948, for a hydro-electric scheme to provide some 24 million kilowatts annually.

**Victoria, Lake**, or **Zor-kul**, or **Sarykul**, lies at an altitude of 13,400 ft. on the S.E. Pamirs, in the Tajik S.S.R. It is a vestige, gradually diminishing in size, of a prehistoric period of glaciation.

**Victoria Land**, named after Queen Victoria, was discovered in 1841 by Capt. James Clarke Ross. It is a region of the Antarctic lying between 180° and 150° E. long. Ross followed its margin as far as 78° 4' S. lat. Here are situated Mt. Erebus (volcanic) and Mt. Melbourne (8337 ft.).

**Victorian Order, The Royal**, see ORDERS OF KNIGHTHOOD.

**Victoria Palace**, theatre in Victoria Street, London. It was opened on Nov. 6, 1911, on the site of the old Royal Standard as a music-hall to seat just under 2000. In May 1935, it was opened as a regular theatre under Seymour Hicks's management and is now owned by Moss Empires Ltd. *Me and My Girl* was produced here in 1937 and was revived in 1945.

**Victoria Regia**, **Queen Victoria**, or **Royal Water Lily**, aquatic plant (family Nymphaeaceae), native of S. Amer. rivs. It has a thick, fleshy root stock, and huge tray-like leaves from 6 to 12 ft. in diameter, green above and purple or violet beneath. The flowers are very large and fragrant. It is grown in tanks in stove-houses.

**Victoria University, The**, Manchester, see under MANCHESTER, Education and culture.

'**Victory**', Brit. battleship of 2164 tons, launched at Chatham, on May 7, 1765,

flies the flag of the commander-in-chief at Portsmouth. She was the flagship of Howe at the relief of Gibraltar (1782), of Hood at Toulon (1793), and of Nelson at St. Vincent (1797) and Trafalgar (1805). The *Victory* is now at Portsmouth. It is maintained in a state of preservation by the Victory Fund, and is open to the public.

**Victory Medal.** The institution of this medal was decided upon by the Associated Powers in March 1919, and its name in all Allied countries is 'Victory Medal' and the ribbon is identical, consisting of two rainbows joined by red in the centre. It was also agreed that the medal should be made of bronze and that the design should be as nearly as possible identical for each nation. On the reverse are the words 'The Great War for Civilisation' (in various languages). The V. M. was awarded to all officers and men who entered a theatre of war on the strength of any military unit, or, in the navy, all officers and men who had been afloat on duty between Jan. 1914-Nov. 1918, extended in 1920 to include the N.-Russian, Siberian, and Caucasian operations. Awards exceeded 5,000,000.

**Victualling, see RATIONS.**

**Victualling Bill, see BILL.**

**Vicuña, or Vicugna** (*Luchenia vicugna*), small ruminant, native of Bolivia and N. Chile. Its soft silky fur or wool is brown in colour, and much valued for the manuf. of choice fabrics.

**Vic-Wells, see under SADLER'S WELLS.**

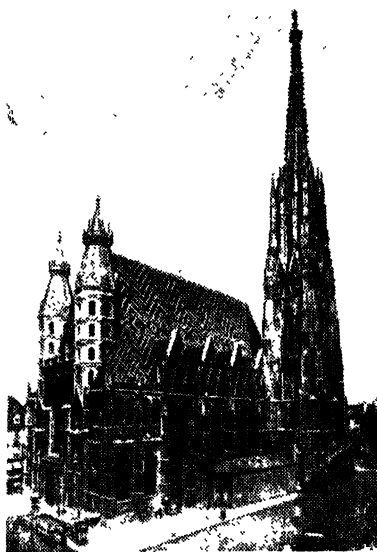
**Vidyasagar, see ISWAR CHANDRA.**

**Vieille-à-roue, see HURDY-GURDY.**

**Vienna**, cap. of the Austrian Republic, and an autonomous federal prov., is situated among woods at the edge of a fertile plain near the low heights of the Wiener Wald. It lies near the Danube, an arm of which, since 1876 converted into a canal, intersects the tn. V. consists of the interior or old city, and the suburbs. The old city is nearly circular, and not above 3 m. in circumference. It is surrounded by a broad fosse, and a wall from 40 to 50 ft. high, which has ten regular bastions, and forms altogether what is called the Bastel or Ringstrasse, the favourite promenade of the city, commanding a very fine view. The inner or old city is very irregularly built: most of the streets are crooked and narrow. The old city is the most fashionable and contains the former palaces of the emperor and of many of the princ. nobility, the public offices, the finest churches, state opera house (burnt out in 1945), and most of the museums and art collections, the colleges, the exchange, and the most splendid shops of V. The public promenades are, besides the Bastel mentioned above, the Glacis, or esplanade between the city and the suburbs; the Volksgarten (the people's garden); the gardens of the palaces of Liechtenstein, Rasumowsky, Schwarzenberg, and the Belvedere; and the Prater, in the suburb of Leopoldstadt, which is an immense park of 2000 ac., stretching to the Danube.

V. is the seat of Protestant and Rom. Catholic archbishops.

Though the Austrian dominions were greatly diminished, V., which possesses over 28 per cent. of the total pop., did not suffer after the First World War as greatly as was expected from lack of trade; it was still the chief commercial city of S.E. Europe. V. is noted for its manufs.



"Donaudland" Vienna

#### ST. STEPHEN'S CATHEDRAL, VIENNA

of silk, velvet, shawls, gold and silver lace and ornaments, linen, cloth, furniture, chemicals, meerschaum pipes, ribbons, carpets, leather goods, porcelain, jewellery, mathematical, scientific and musical instruments, watches, fine cutlery, gloves, lace, straw hats, paper, etc.

**History.**—There was originally a Celtic settlement where V. now stands. Later the Romans built a garrison tn. named Vindobona, and Marcus Aurelius is said to have died there (A.D. 180). For the next 900 years V. was overwhelmed by the barbarians and passes out of hist. In 1137 'Wienn' is mentioned as a 'civitas' and the same year Henry Jasomirgott made it the cap. of his duchy of Austria. He estab. his court Am Hof outside the old walls; St. Stephen's Cathedral was founded in the same year. V. became an important commercial tn. and trading centre and the seat of the Babenberger, who kept a brilliant court and encouraged the arts. (Walther von der Vogelweide began his poetical career there.) In 1278 V. became the Hapsburg cap. and was about the size of the present Inner City. Its univ. was founded in

1356 by Rudolph IV., and the tn. became the seat of many fine churches and monasteries. Many of these were destroyed in the great fire which ravaged the city in 1525, and in 1529 V., as the outpost of the Christian world in the W., withstood a long siege from the Turkish troops. In 1683 V. was for the second time besieged by the Turks without success. V. was a centre for the Counter-Reformation, and many churches both within and without the city walls, such as the Jesuits and the Schwarzsapianer, date from the early baroque period. The defeat of the Turks ushered in a time of rapid expansion and the building of many palaces (e.g. Schwarzenberg), churches (e.g. Karlskirche) and other buildings in sumptuous baroque style. The early nineteenth century saw V. as the typical 'Alt-Wien' of tradition, and the home of many famous composers, including Beethoven, Schubert, and Strauss. In 1878 the students and the industrial workers of the suburbs led a revolution which was quickly subdued by imperial troops. Under Francis Joseph (1848-1916) the old ramparts were levelled and the Ringstrasse was built in their stead and sev. great buildings were erected, such as the Opera, the Parliament, the new Rathaus, the new univ., the Burgtheater and the Votivkirche. The pop. of the city grew rapidly in the second half of the nineteenth century, especially in the new industrial suburbs. In 1897 burgomaster Leuger began the modernisation of the city. The aftermath of the First World War and the Revolution of 1918 caused great suffering in the city. Under the Social Democrats V. became the cap. of the new Austrian republic with the status of a prov. (1921). The Social Democrat municipality launched an ambitious programme of social reform and V. was among the first cities in Europe to build modern blocks of flats with courts, etc., for workers. The unsettled state of the country and the economic difficulties following the war led to sev. risings and clashes of rival parties which had V. as their starting point. From March 1938 until April-May 1945, V. was occupied by Ger. troops and became an integral part of Germany as the cap. of the 'Ostmark.' In April the Russians first entered the dists. of V., and later it was jointly occupied by the armed forces of the four allied powers and divided into four zones, the Inner City remaining international. (See also AUSTRIA, History).

The damage which V. sustained in the Second World War was due to artillery fire and street fighting rather than direct air attack. The damage to objects of art was confined mostly to buildings, for the great collections had been evacuated or stored in deep cellars. St. Stephen's cathedral was damaged by fire. Pop. 1,734,000. See D. A. Fischer, *Vienna: The Town and its Buildings*, 1946.

**Vienna, Congress of.** A congress of European statesmen held in 1814 after Napoleon's exile to Elba, to settle the peace of Europe. Before the deliberations of the congress had ended, Napoleon

escaped from Elba and landed in France, See further under EUROPE: HISTORY—From the French Revolution to the Franco-Russian War, 1871.

**Vienna:** 1. Dept. of W. Central France, formed in 1790 out of about four-fifths of Poitou, and of Touraine and Berry. It is situated between Indre on the E. and Deux-Sèvres on the W., and is divided into the three arrons. of Poitiers, Châtellerault, and Montmorillon. Vines and cereals are produced. Poitiers is the cap. Area 2711 sq. m. Pop. 313,900. 2. Tn. in the dept. of Isère, France, on the l. b. of the Rhone, 20 m. S. of Lyons. It has lead and copper mines, and manufs. of wool, silk, wines, etc. It is the anct. city of *Vienna*, chief bn. of the Allobroges. It has Rom. ramparts, a temple to Augustus and Livia, an amphitheatre and other interesting relics. Its cathedral dates from the twelfth century. Pop. 23,500.

**Vienna, Haute-**, dept. of S.W. France, formed from parts of Limousin. Area 2120 sq. m. The surface is diversified by the mts. of Limousin, Ambazac, and Blond. The Vienne is the chief riv., with tribs. Maude and Briance. Cereals, hemp, and colza are grown. The minerals are kaolin, granite, and mica. Lunoges, the cap. is noted for its porcelain. Area 2119 sq. m. Pop. 336,330.

**Viersen**, tn. in N.-Rhine-Westphalia, Germany, 10 m. W.S.W. of Krefeld; Manufs. include velvet, plush, silk, and damask. It suffered heavy damage in the Second World War. Pop. 33,600.

**Vierwaldstättersee**, see LUCERNE, LAKE OF.

**Vierzion**, tn. in the dept. of Cher, France, on the Cher; it manufs. porcelain, glass, and agric. implements. Nearly one-quarter of V. was destroyed in the Second World War. Pop. Vurjon-Ville, 11,300 (with V. Village, V. Forgès, and V. Bourgneuf, 25 800.)

**Viet Minh**, see under INDO-CHINA, FRENCH.

**Viet Nam**, from 1944 to 1948, native republic which, after the surrender of Japan in the Second World War, gained control of Tonking, and most of Annam. From 1949, officially a state within the Fr. Union. (For hist. 1944-48 see under INDO-CHINA, FRENCH.)

The Fr. National Assembly on May 22, 1949, agreed to end the colonial status of Cochinchina. This cleared the way for the unification of the three provs., Tonking, Annam, and Cochinchina, which together now (1950) form the State of V.N. and are independent within the Fr. Union. All attempts to win over or subdue the Viet Minh party failed, but it was the hope of the Fr. that Bao Dai (who resumed the title of emperor) might be able to ally to himself those nationalist but non-Communist elements who had hitherto supported Viet Minh. Conventions signed in Dec. 1949 by Bao Dai and the Fr. High Commissioner in Indo-China confirmed the transfer of power by the Fr. to the emperor's regime, subject to the ratification of the texts by the Fr. Assembly. In 1950 the position in V.N. remained confused. Russia announced

that she had entered into diplomatic relations with the 'Democratic Republic' of V.N. (viz. the Viet Minh party). The Brit. Gov. had not then recognised Bao Dai's state, but did so later. *See also* *INDO-CHINA*, *FRENCH*. *See* J. Bidault, *La Paix au Viet-Nam*, 1947.

**Vigée Le Brun, Marie Louise Elizabeth**, *see* *LEBRUN*.

**Vigeland (Adolf) Gustaf** (1869-1943), Norwegian sculptor, b. at Oslo. His symbolical naturalism (in which he followed Rodin) profoundly influenced and virtually monopolised Scandinavian sculpture for nearly half a century. Many of his most remarkable works are in the Frognerpark at Oslo. This park contains a vast collection of V.'s figures, V.'s conscious attempt to express every aspect of the human spirit in stone. He is said to have been the most prolific sculptor of all time.

**Vigfusson, Gudbrandr** (1828-89), Icelandic scholar, graduated from Copenhagen Univ.; was appointed reader in Scandinavian art at Oxford in 1884. Besides editing with F. York Powell classic Scandinavian poetry in the *Corpus Poeticum Boreale* (1883) and a number of Icelandic classics and sagas, he compiled and issued an *Icelandic-English Dictionary* (1866-73).

**Vigil**, in the modern church, the day of preparation before a great festival. In the early church the V. was the night before a festival, and was spent in watching and prayers.

**Vigilance Societies**, exist for the protection of women and young people. The National Vigilance Association and Travellers Aid Society was founded in 1885 to protect the public and in particular the young, against commercialised vice and public immorality. Co-operation is maintained with a number of statutory and voluntary agencies concerned with the welfare of women and young people. Autonomous branches of the Association exist in sev. big tns. and ports. The National Vigilance Association of Scotland was founded in 1910 to carry on the same type of work, branches operating at Glasgow and Edinburgh.

The International Bureau for the Suppression of Traffic in Women and Children was founded in 1899 to study this problem in its international aspects and to secure national and international legislation which would prevent sexual exploitation of women and children by third-party vested interests. Branches of the International Bureau exist in many countries and close liaison is maintained. The League of Nations undertook a world-wide study of traffic in women in 1927, which resulted in close co-operation between many countries through international conventions designed to punish those who exploit the prostitution of others. The last convention considered by the United Nations (which carries on the work of the League in this field) was adopted by the General Assembly in Dec. 1949.

The Public Morality Council, founded in London in 1899, unites within its mem-

bership most of the religious denominations together with some 200 social and educational bodies throughout the country, in the endeavour to raise the standard of public morality in all its manifold aspects. *See also* *PROSTITUTION*.

**Vigiles**, *see* *under* *ROMAN ARMY*.

**Vigilius**, name of one pope. *Vigilius* was pope from 537 to 555. He was elected at the instance of Justinian, emperor of the E. Under pressure from the Emperor, V. gave his support to the doctrine of the 'Three Chapters'.

**Vignola (Giacomo Barozzi, or Barocci)** (1507-73), It. architect, b. at Vignola, near Modena. He succeeded Michelangelo as the architect of St. Peter's, Rome, and designed the Escorial in Spain.

**Vigny, Alfred Victor, Comte de** (1799-1863), Fr. poet, b. at Loches (Indre-et-Loire). He came of a military family, and served in the army for twelve years. He pub. his first vol. of poems in 1822, and four years later his famous prose romance *Cinq-Mars*, followed by *Poèmes Antiques et Modernes*. In 1832 appeared his drama of *Chatterton*, and amongst his other dramatic work may be mentioned *Quelle pour la Peur*, and *Shylock*, adaptation of *The Merchant of Venice*. He left a vol. of verse, entitled *Les Destinées* (1861), containing some fine poems, and *Journal d'un Poète* (1867). V.'s poetry is notable for its grandeur and starkness, and for its constant theme of suffering. He saw man as a pigmy, with a God entirely uninterested in his suffering, and evolved a stoic philosophy as humanity's only solace and solution. *See* lives by M. Paléologue, 1891; G. Assé, 1895; A. France, 1923; A. Whitridge, 1933; B. de la Salle, 1939, and E. Lauvrière, 1945.

**Vigo**, seaport and fort tn. in the prov. of Pontevedra, Spain, on the Rio de V. It is a resort for sea-bathing, and has a wireless station. It has a deep and spacious harbour, 20 m. long, and 50 m. wide, and important sardine, tunny, and other fisheries, and is a port of call of sev. steamship lines. Shipbuilding is also carried on, and there are tanneries, cordage works, soap works, distilleries, flour and paper mills, machine shops, and petroleum and sugar refineries. The tn. was attacked by Drake in 1585 and 1589, and in 1702 the allied Anglo-Dutch fleet under Rooke sank the Fr. and Sp. ships in V. Bay and captured £1,000,000 from the Sp. treasure fleet from America. Pop. 113,600.

**Vihara**, *see* *ARCHITECTURE—India*.

**Viipuri, or Viborg**: 1. Former dept. in S.E. Finland, since 1940 mostly a part of the Karelo-Finnish S.S.R. It is in great part plateau, and there are many lakes, including Lake Saima, which communicates with the sea by Saima Canal. There are numerous granite quarries and iron works, but the soil is poor. Area 12,000 sq. m. Pop. (1940), 628,300. 2. Tn. of the above at the head of Viborg Bay, in the Gulf of Finland, exports timber, iron, paper, butter, etc. The historic castle, erected in 1293, is one of many antiquities. There are machine

shops and saw-mills, besides foundries, but V. is better known as a tourist resort, the environment being most picturesque. V. fell to Soviet Russia as a result of the Soviet-Finnish war of 1940, after which Russia created the Karelo-Finnish S.S.R. Pop. 74,200. See also under FINLAND (HISTORY), *Finnish-Russian War*, 1939-40.

**Viking Art.** The art of the Vikings did not in any sense replace that of the Saxons (see SAXON ART) in Britain, and it is not until the latter part of the tenth century that its influence becomes at all marked. In the period of the raiding expeditions, the subsequent period of colonisation, and the time of the Dan. wars, there is little beyond a few brooches, many of the characteristic tortoise form worn in pairs on the shoulders, pins, and other small objects of bone and ivory.

It is usual to recognise three styles in Viking art. The *Jellinge* style, named from a Dan. royal grave in Jutland, is based on heavy animal designs, of which the Great Beast, to be seen on the famous Jellinge rune-stone itself, is one variety. In Britain the style is well represented on the 14½ ft. high standing cross in Gosforth (Cumberland) churchyard.



Guildhall Museum: Lathary Committee of the Corporation of London

VIKING GRAVE SLAB (WIDTH 2½ IN.)  
WITH ROOFS, FROM ST. PAUL'S, LONDON

An elaborate foliage ornament and interlacing are to be noticed in the *fringe-like* style, named after the dist. in Norway where it is well represented carved in the local sandstone. But one origin of the style can be found in the Winchester school of illuminated MSS. A particularly interesting example of it may be seen in a rune-inscribed slab, part of a tomb, found in St. Paul's churchyard in 1852 and now in the Guildhall (City of London) Museum; this early eleventh century sculpture of a 'Great Beast' and serpent, originally coloured, is the most notable relic of the Vikings in Britain.

The carving on the wooden doors of *Urnes* church on the Sognefjord, Norway, gives its name to the Urnes style, though the distribution in Scandinavia is wider than the name might suggest. It found brilliant exposition in Irish metalwork (e.g. the Cross of Cong, c. 1123), and it had an equally important place in Eng. Christian art. See T. D. Kendrick, *Late Saxon and Viking Art*, 1949 (chapters x., xi., xii.). For the earlier historic background, see R. H. Hodgkin, *A History of the Anglo-Saxons*, 1939 ed. (chapters XIII.-XVI.).

**Vikings**, see NORSEMEN.

**Villa**, in the archaeology of Rom. Britain, a self-supporting country house with an attached farm, worked with slave labour and generally owned by Romanised Britons. Subsidiary industries, e.g. fulling and metal-working, were sometimes carried on. Vs. were common in the low-land zone of Rom. Britain, though rare in the highland zone where conditions were less settled and peaceful. Some were built on sites of earlier Belgic farms, especially in S.E. Britain. Though showing many variations of size and plan, Vs. may be generally divided into three prin. types. Most are of the 'winged corridor' type: the corridor extended along the front of the house with projecting rooms at each end, and often with one or two rows of rooms behind. Examples are found at Callow Hill and Ditchley in Oxfordshire. The largest Vs. were of the 'courtyard' type, often formed by additions to an earlier building, as at North Lough, Oxfordshire. The third type was the 'basilican' comprising a rectangular building divided by two rows of posts into a nave and two aisles; rooms were formed by the use of internal partitions. Most Vs. had hypocaust heating, and many had baths. Tessellated pavements and plastered and painted walls were common.

**Villa Borghese**, see BORGHESE, VILLA.

**Villach**, tn. of Austria on the Drave, in the prov. of Carinthia, with manufs. of lead, cement, colours, chemicals, and foodstuffs. It is the centre of the wood trade with Italy. There are hot sulphur baths in the vicinity, and about 9 m. to the W. are the lead mines of Bleiberg. Here, in 1492, the Gers. gained a victory over the Turks. Pop. 30,800.

**Villa de Corro Largo**, see MELO.

**Villafranca**, tn. in the prov. of Verona, Italy. The peace preliminaries were signed here in 1859 by Napoleon III. and the emperor Francis Joseph after the battle of Solferino. Pop. 14,500.

**Village Community**, term used in a general sense to signify the individuals, families, and groups forming a vil. society considered as a closely related or integrated whole. In the Middle Ages in Europe, V. Cs. show a well defined economic and social organisation; much or all land was held in common, and agriculture and pasturage followed traditional methods; arable fields were divided into strips or patches, shared out among the households which might be interchanged and are cropped in rotation (the two or three

field system) from year to year; pasture waste, and woodland were common with defined rights of usage.

**Villa Maria**, tn. of Argentina, in the prov. of Córdoba, on the Bartolomé Mitre and San Martín Railway, 343 m. from Buenos Aires. It trades in grain, timber, and dairy produce. In 1872 it was chosen by Congress as Federal cap. Pop. 35,000.

**Villani, Giovanni** (c. 1275-1348), It. chronicler, b. at Florence. He spent some time in travel, being engaged in commerce, and visited France and Flanders. His *Histoire Florentine* or *Cronica Universale* begins with biblical times and comes down to 1348, and is a general chronicle extending over the whole of Europe. It was continued by Matteo V., his brother, and Matteo's son, Filippo V., who take the chronicle down to 1364. There are Eng. trans. of portions, by R. E. Sefse (1896).

**Villa Nova de Portimão**, see PORTIMÃO.

**Villa Real**, dist. of Portugal, in the Trás-os-Montes prov. Wine is produced along the Douro, and there is cattle-rearing. The cap. is V. R. Area 16.5 sq. m. Pop. 289,100.

**Villarica**, tn. of Paraguay, cap. of the dept. of Guairá, second city of the republic. It is on the main line of the Central Paraguayan Railway, 90 m. from Asunción. Its chief products include tobacco, yerba maté, sugar, cotton, etc. There are sugar refineries, saw-mills, and flour-mills. Pop. 31,000.

**Villars, Claude Louis Hector, Duc de** (1653-1734), marshal of France, b. at Moulins. He served in the Dutch wars and also helped the elector of Bavaria against the Turks, and in 1702 defeated the margrave of Baden at Friedlingen. In 1709 was sent to command the main army opposing Eugene and Marlborough on the N. frontier, but was wounded at Malplaquet. He was at the head of the last army France could raise and saved his country by his victory at Denain (1712), when he fell upon the Brit. and Dutch under Albemarle and drove Prince Eugene under the walls of Brussels, negotiating the peace of Rastatt (1714). His *Mémoires* were ed. by the marquis of Vogüé (1884-92).

**Villefranche-sur-Saône**, tn. in the dept. of Rhône, France, on the Saône, noted for its cloth, Beaujolais wine, and cattle. Pop. 20,000.

**Villagas, Francisco Gómez de Quevedo y**, see QUEVEDO.

**Villehardouin, Geoffroi de** (c. 1160-c. 1213), Fr. historian, b. in Aube. He took part in the Fourth Crusade, and witnessed the capture of Constantinople in 1204. His *Histoire de la Prise de Constantinople par les Français et les Vénitiens* is an extremely valuable record of the events of the crusade. There is an Eng. trans. of the *Chronicles* (with that of de Joinville), by Sir F. Marzials in Everyman's Library (1908).

**Villainage**, in feudal law, villeins were those who held lands by base or servile tenure. The system of V. began to die out in the fourteenth century. See P. Vinogradoff, *Villainage in England*, 1892;

W. S. Holdsworth, *History of English Law*, 1903, 1938; and F. Pollock, and F. W. Maitland, *History of English Law*, 2nd ed. 1911.

**Villemarqué**, see LA VILLEMARQUÉ, THÉODORE CLAUDE HENRI HERSART, VICOMTE DE.

**Villena, Enrique de** (1384-1434), Sp. writer, showed great capacity for learning and was reputed to be a wizard. He pub. *Arte de Trovar*; *Los Trabajos de Hércules*, a pedantic allegory; *Tratado de la Consolacion*; *Arte Cisoria*, a handbook on the pleasures and fashions of the table; *Libro de Ojamiento*, a dissertation on the evil eye and its effects; and the first trans. of the *Æneid* into Sp.

**Villeneuve, Pierre Charles Jean-Baptiste Silvestre** (1763-1806), Fr. sailor. At the age of fifteen he entered the navy, was rapidly promoted, and in 1796 attained the rank of rear-admiral. In the battle of the Nile he commanded the rear of the fleet and escaped with two ships and two frigates to Malta. In 1801 he was in command of the Toulon squadron and in 1805 was defeated and taken prisoner off Cape Trafalgar (see TRAFALGAR, BATTLE OF). In 1806 V. was liberated and returned to France.

**Villiers, Barbara**, see CLEVELAND, DUCHESS OF.

**Villiers-Bocage**, tn. in the dept. of Calvados, France, about 12 m. S.W. of Caen. On June 13, 1914, began the battle of V.-B. between the 7th Armoured Division ('Desert Rats') and the 4th Coy. of London Yeomanry on the one side, and a Ger. armoured div. equipped with Tigers and Panthers, which drove into the tn. from another direction. The Brit. force was unable to maintain itself in the tn. with its lightly-armoured Cromwell tanks and was forced to withdraw after suffering severe losses. It was some time before V.-B. was recaptured by Brit. troops and in the interval there took place the pattern bombing which greatly increased the destruction. Pop. 700.

**Villers-Cotterêts**, tn. in the dept. of Aisne, France, 14 m. S.W. of Soissons. Its castle, built by Francis I., is a home for the aged. The elder Dumas was b. in V.-C. It was the scene of heavy fighting in the retreat from Mons in 1914.

**Villiers, George William Frederick**, see CLARENDON, EARL OF.

**Villiers**, see BUCKINGHAM, GEORGE VILLIERS, DUKE OF.

**Villiers de l'Isle-Adam, Philippe Auguste Mathias, Comte de** (1840-89), Fr. poet, b. in Brittany. He gained a reputation as a satirist and a poet. Among his works are: *Isis* (1862); *Morgane* (1862); *Le Nouveau Monde* (1876); *Contes cruels*, a fine vol. of short stories (1883, 1886) (Eng. trans. Hamish Miles, *Sardonic Tales* 1927); and *Azel* (1890) (Eng. trans. by H. P. R. Fuberg, 1925). V. is a master of the story of mystery and terror. See life by E. de Rougemont, 1910.

**Villon, François** (1431-c. 1485), Fr. poet, b. of poor parents in Paris, real name probably Montcorbier. He called himself Villon after a priest who became his benefactor. At an early age he



became a student in arts, and by 1452 had taken his M.A. degree. After this little is known of him until 1455, when he was sentenced to banishment for killing a priest in a street brawl: 1456 saw him again in trouble, and the following year he was accused of being the ringleader of a gang of burglars, and sentenced, with others, to be hanged. Having appealed, he was banished and went to Roussillon in Dauphiné, but in 1461 he was caught at his old practices and imprisoned at Meung-sur-Loire. Being released he was promptly involved in a street quarrel and again arrested, tortured, and condemned to be hanged, but the sentence was commuted to banishment (1463). From this time V. passes from hist., but is supposed to have died in the house of the abbé of St. Maixent in Poitou. He was the author of *Grand Testament* (1456), *Petit Testament* (1461), and some forty or fifty short pieces, chiefly ballades, notably: *Ballade des Dames du Temps Jadis*; *La Grosse Margot*; *Ballade des Pendus*; *Ballade pour sa Mère*; *Regrets de la Belle Heaulmère*, which occur mainly in the body of his *Grand Testament*. His two books of verse remain among the great treasures of Fr. poetry. It was V. who perfected the ballade and rondeau. V. was all things by turns in his poetry—witty, sardonic, gay, mocking, plunged into the utmost despair, penitent, and at times deeply religious. The best modern eds. of V.'s poems are those of Paul Lacroix, Pierre Jannet, Longnon (1892); revised by J. Foullet (1932), Moland (1893), H. de Vere Stacpoole (1913); and G. Atkinson (with trans.) (1930). See P. Champion, *François Villon sa Vie et son Temps*, 1913, 1932; D. B. Wyndham Lewis, *François Villon: a Documented Survey*, 1928; L. Wharton (trans.), *Poems of François Villon*, 1935; L. Cons, *État présent des études sur Villon*, 1936; and Cecily Mackworth, *François Villon*, 1948.

**Vilna**, or **Wilno**, formerly a prov. of Poland but now a Region of the Lithuanian S.S.R. It had an area of 11,000 sq. mi. and was bounded on the S. by the prov. of Novogrodek, E. by Lithuania, N. by Latvia, and W. by Russia. It consists of an extensive forest-covered plain broken with low hills. Rye, barley, wheat, oats, hemp, and flax are grown, and timber and furs exported. Pop. (1937), 1,000,000, comprising Poles, White Russians, and Lithuanians, almost two-thirds of the pop. being Poles. The chief tns. of the region are Vilna (Vilnius), Wlodek, Syentsyany, Disna, Wilejka, Nyemchin.

**Vilna**, or **Wilno**, cap. of V. Region and of the Lithuanian S.S.R. It is situated on the Viliya R., near the junction of the Liepaja (Libau)-Don, Leningrad-Warsaw, and Liepaja-Odessa railways. The old part of the city, has survived almost intact from the eighteenth century. It contains an imperial palace, the Rom. Catholic cathedral of St. Stanislaus (1387), the Gk. Orthodox cathedral of St. Nicholas, built 1596-1604, a valuable museum of antiquities, and other historic buildings. Its univ. was founded in 1578.

It is an important centre for timber, grain, cattle, wool, and flax.

In the thirteenth century V. was the cap. of Lithuania, but after the union of Lithuania and Poland during the reign of Casimir IV. (1427-92), the tn. became a centre of Polish culture. In the seventeenth century, when Poland was attacked by Sweden, Russia, and Brandenburg, V. was taken, and finally in the third partition of Poland the prov. of V. became a Russian gov. with V. as its capital. During the First World War V. was taken by the Gers., but in 1918-22 changed hands between the Lithuanians, Russians, and Poles sev. times. See under *POLAND, History*.

V. was captured from the Gers. in mid-July, 1944, by the Russians and became Soviet ter. after the Second World War. Pop. 208,000.

**Vilvoorde** (Fr. *Vilvorde*), tn. in Brabant, Belgium, 6 m. N.N.E. of Brussels, situated on the maritime canal from this city to the Rupel. There are mills, breweries, and manufs. of lace, bristles, food-stuffs, chemicals, hardware, varnish, glue, and starch. Pop. 25,600.

**Vimeiro**, vil. in Estremadura, Portugal, where Wellington defeated the Fr. under Junot, in the first important engagement of the Peninsular War (q.v.), on Aug. 21, 1808. Pop. 700.

**Vimy Ridge**, upland in the dept. of Pas-de-Calais, France, 5 m. N.E. of Arras. The Gers. captured V. R. in the early part of the First World War and held it against Fr. attacks in 1915. Canadian forces stormed the ridge on April 9-10, 1917, and 11,295 missing are commemorated by a memorial unveiled in 1936.

**Vina del Mar**, residential suburb of Valparaíso, 5½ m. from the port, with which it is connected by rail along the shore. Pop. 70,000.

**Vinan**, see BINAN.

**Vinca**, see PERIWINKLE.

**Vincennes**: 1. Suburb on the E. of Paris, France, in the dept. of Seine. Its celebrated castle, which now serves as a fort, arsenal, and barracks, was built by Philip of Valois, John, and Charles V., on the site of a feudal fortress founded in 1164 by Louis VII. It was later a prison. The Bois de Vincennes, which was the site of the Fr. Colonial Exhibition, 1931, lies between the fortifications of Paris and the r. b. of the Marne. V. has manufs. of chemicals, pianos, organs, metal plates, perfumery, and mineral waters. Pop. 49,200. 2. City of Indiana, U.S.A., co. seat of Knox co., on the Wabash R. It has a Rom. Catholic cathedral (1835) and a univ. (1896), is a railway and manufacturing centre, and produces ploughs, cultivators, ice-cream moulds, has paper and strawboard mills, furniture factories, and manufs. radio cabinets. There are also flour mills, iron foundries, and machine shops. There are coal mines and gas and oil wells. It is the site of a Fr. fort, taken in 1763 by the Brit. Captured by the Amers. in 1778 and renamed Fort Sackville, Clark recaptured it in 1779, and it was ceded to the U.S.A. in 1783. It was formerly cap. of the ter.

of Indiana, and is the oldest settlement in the State. Pop. 18,200.

**Vincent, Sir Edgar**, see D'ABERNON, VISCOUNT.

**Vincent de Paul, St.** (1576-1660), Fr. priest and philanthropist, b. at Pouy. He was ordained priest in 1600, but on a journey to Marseilles in 1604 he was taken prisoner by Turkish pirates but eventually escaped. He became curé of Clichy, and then tutor to the children of the Gondi family. He soon devoted himself under the guidance of Bérulle, to the relief of the poor, establishing what he called 'confréries de charité' in various tns. in France. In 1625 he founded the Congregation of Mission Priests to train preachers who were to act as assistants to the regular clergy; and in 1632 the Mission of the Sisters of Charity, who are devoted to the care of the sick. He was canonised in 1737. See T. Maynard, *Apostle of Charity*, 1940.

**Vincenzo di Biagio**, see CATENA.

**Vinci, Leonardo da**, see LEONARDO.

**Vindhya Mountains**, series of mt. ranges in Central India, connecting at the extremities with the E. and W. Ghats.

**Vindhya Pradesh**, former United State of central India. It was formed in April 1948 of 35 states known as Bundelkhand and Baghelkhand States (including Rewa). Local rivalries, and economic and political backwardness, however, necessitated its conversion, on Jan. 1, 1950, into a Chief Commissioner's Province.

**'Vindictive'**, ship used in the Brit. naval raid on Ostend (q.v.) in 1918. The V. was sunk, partially closing the harbour.

**Vine**, climbing plant of the genus *Vitis* and of the natural order Vitaceae. *V. vinifera* is the common grape V. and other species of grape V. include *V. aestivalis*, *V. labrusca*, *V. rotundifolia*, etc., but *V. vinifera* is the best known and longest cultivated. The plant is a native of Asia, cultivated from a remote period for its fruit which, besides being one of the choicest dessert fruits (dessert varieties include Hamburg, Muscat, Gros Maroc, Gros Colmar, Muscadine, Sweetwater, Alicante, etc.), is made into wine and other fermented drinks, while the dried fruits of certain varieties (Malaga, Sultan, Alexandria, and Gordo Blanco) furnish raisins and currants. The V. was formerly much planted against sunny sheltered walls in the S. of England, but its production of fair-sized fruit is irregular. In a greenhouse its culture is easy; the roots are generally set in a border outside, the stem passing under arches or through holes into the house, where the shoots are trained up the roof. By control of the temp. and management of ventilation fruit can be ripened, according to variety, over many months. The following are the prin. V. producing countries (1949) with their extent of vineyard in acri.: Italy, 11,000,000; France, 3,800,000; Spain, 3,500,000; U.S.A., 780,000; Algeria, 700,000; Hungary, 600,000; Portugal, 5,500,000; Yugoslavia, 500,000; Rumania, 420,000; Greece, 360,000; Argentine, 320,000; Germany, 203,300; Bulgaria, 200,000; Australia, 140,000;

Switzerland, 50,000. The fruit is liable to attack by an aphid called phylloxera (q.v.). See A. F. Barron, *Vine and Vine Culture*, 1900; A. J. Perold, *A Treatise on Viticulture*, 1927; E. J. Robson, *A Wayfarer in French Vineyards*, 1928; A. Bates, *Port from the Vine to the Glass*, 1936; E. Forbes, *Wines for Everyman*, 1937 and E. Hyams, *The Grape Vine in England*, 1949.

**Vinegar**, weak solution of acetic acid containing colouring matter, is obtained by the acetic fermentation of poor wine, sour beer, or other dilute alcoholic liquids, by the Fr. or Orleans process, or the Ger. or 'quick' process, now generally in use. V. by the Fr. process contains 6 to 10 per cent of acetic acid, whereas that from the quick process contains only 4 to 6 per cent. White V. is obtained from inferior wines, while malt V. is prepared from beer.

**Vinegar Hill**, mt. in Ireland, 14 m. from Wexford, where, in 1798, the Irish rebels were defeated by General Lake.

**Vingt-et-un**, or **Pontoon**, old card game, the object in which is to make out of the cards one holds 'twenty-one.' One card is dealt, face downwards, to each player, including the dealer or banker. Maximum and minimum stakes are arranged beforehand. The players look at their cards and stake accordingly. The game proceeds thereafter by a second deal and by the exercise of the option to draw further cards so as by a certain combination to make the desired total. An ace counts as 11 or 1, court cards 10, and the other cards according to 'pips.' The combination of an ace with a court card or other tenth card is called a 'natural.'

The dealer, after the first round is dealt, has the right to double the stakes. The second round is then dealt. Those holding 'naturals' get three times their stakes from the banker. The dealer must then offer fresh cards in rotation, beginning with the player on his left. If a player wishes he can buy cards, and have them dealt face downwards to him, or have them 'twisted,' dealt face upwards. If he draws a card which brings his total over 21, he is said to have gone 'bust,' and hands his stake to the dealer. Those who have not overdrawn are said to 'stand' (whether their total is 21 or under), but the total must not as yet be revealed. The dealer's turn comes last. If he overdraws, he has to pay all round, except to those who have already handed in their stakes, by reason of overdraw. The player with exactly 21 gets double his stake. If the dealer wins, he gets double his stake from each of the others remaining in the game. There is a variation of this game called *Fr. vingt-et-un*.

**Vinnitsa**: 1. Region of the Ukrainian S.S.R. 2. Cap. of the above, on the R. Bug, 120 m. S.W. of Kiev, founded in the fourteenth century. Vehicles, tobacco, candles, and soap are produced. Pop. 92,900.

**Vinogradoff, Sir Paul Gavrilovich** (1854-1925), Russo-Brit. jurist, b. at Kostroma, N.E. of Moscow, became prof. of hist. at Moscow Univ. Resigning because of conflicts with the authorities in 1902, he took

up residence in England. From 1903 he was prof. of jurisprudence at Oxford, and was knighted in 1917. His best known pub. is the important *Villennage in England* (1892).

**Viol** (It. *viola*), generic name for the chief family of bowed stringed instruments, preceding that of the violin, of the fifteenth to the seventeenth century. The V. was made in four sizes, and had from five to seven strings, tuned in thirds and fourths: (i.) the treble or descant; (ii.) alto, tenor, or viola da braccio; (iii.) bass, viola da gamba (corresponding respectively to the modern violin, viola, and violoncello), and (iv.) the contra or double bass, still in use.

**Viola**, genus of perennial plants (family Violaceæ) which includes the violet (f. *odorata*), the pansy (f. *tricolor*), and the tufted pansies or florists' V's.

**Viola**, or **Tenor Violin**, see under **VIOLIN** and **VIOLIN**.

**Viola di Bordone**, see **BARYTON**.

**Violet**, large genus of herbs (family Violaceæ), interesting for their production of cleistogone flowers, yielding an abundance of seed in autumn; while the more conspicuous familiar spring flowers yield little or no seed.

There are some 250 species, found mostly in temperate or mountainous regions of the N. hemisphere, also in mountainous dists. of S. America and S. Africa, and, to some extent, in Australasia. Brit plants include the sweet V., marsh V., hardy V., dog V., and mt. V.

**Violin**, **Viola**, **Violoncello**, and **Double Bass**, stringed musical instruments played with the bow.

**Violin**.—The violin consists of a resonant wooden box called the body; the neck, a solid piece of wood to which is attached the fingerboard; and the strings, fastened at one end to the lower part of the body by means of a projecting tail-piece, and at the other to pegs in the head, the scroll-like termination of the neck. The body consists of two thin, a. bed pieces of wood joined by side-pieces, or ribs, to form a shallow box. The top surface, or belly, is made of a soft wood, pine or fir. The under surface, or back, is generally of maple or sycamore, as are the ribs. The body is so constructed that there are two deep inward curves in its sides, nearly opposite the portion of the strings on which the bow plays. The neck also is of maple, glued and mortised to a block fixed in the upper part of the body. The tail-piece and finger-board are of ebony, this hard wood being specially necessary in the latter case to prevent the finger-board from being worn into hollows by the player's fingers. Sound-holes are cut in the belly in the form of an f on either side of the bridge. The bridge itself is of maple, cut in a peculiar shape, which has remained practically unaltered since its introduction by Stradivarius. Under the right foot of the bridge (or rather a little way behind it) is the sound-post, a small rounded bar of soft pine, joining the back and belly of the instrument, and serving the double purpose of supporting the pressure of the

strings and communicating the vibrations to the back. Without the sound-post the tone would be very weak and of a poor quality. The bass-bar is a strip of wood glued to the inside of the V., and passing under the left foot of the bridge. The strings are of catgut (the E string is often of steel wire), and are tuned in fifths, the highest, or first string, sounding the E on the fourth space of the treble clef, and the other three the A, D, and G. Since the time of the early 11. masters there has been scarcely any alteration in the shape of the V., and modern makers are still following the model of Stradivarius, and endeavour, unsuccessfully, to reproduce his exquisite tone.

The *Viola* is slightly larger than the violin, and more than proportionately thicker. It is tuned in fifths and a fifth below the violin. Music for this instrument, which is called the tenor violin, is generally written on the C clef (third line). Its tone is somewhat grave and melancholy, and it has an attractiveness quite different from the charm of the violin.

The *Violoncello* is much larger than either violin or viola, and is held between the player's knees. Like the others, it has four gut strings, but in this case the two lower strings are generally silver-covered. The signature is the bass clef, and it is tuned in fifths, an octave below the viola.

The *Double Bass* is largest of all, having a deep, rough tone. It differs somewhat from the other stringed instruments chiefly in having sloping shoulders, and in being differently tuned. Formerly double-basses had only three strings tuned in fifths (A, D, G, on the bass stave), but a fourth string is now usually added, sounding the E below the stave, and the strings are tuned in fourths (E, A, D, G). The *mute* is a contrivance for fixing on the bridge of all stringed instruments to deaden the sound. It produces a muffled, silvery note, which, when properly used, is very effective.

The V. is said to be derived from the Asiatic *savastrom*. This reached Europe as the Persian or Arabian *rebab* (Fr. *rebec*) from which the *viol* (q.v.) group derived.

The first maker of V's, who is known to have produced the instrument as we now have it was Gaspar da Salo, who worked about 1560. His V's were large, very arched, and varnished dark brown. After him came the Brescian school of Maggini, Zanetto, Peregrino, Raphael, and others. Early in the sixteenth century Andrea Amati founded the Cremona school. He made some improvements, but accomplished less than did his sons, Antonio and Jerome. The most famous member of this family was Nicolo (1596-1684), son of Jerome, who taught the still more famous Antonio Stradivarius (q.v.) (1614-1737). The latter, as said above, has set the standard for succeeding generations. Among his pupils the foremost were Carlo Bergonzi and Giuseppe Guarneri. In the family of the latter there were many V. makers, the most successful being Giuseppe Antonio Guarneri (q.v.) (1683-1745). The work of Stainer, b. in the

Tyrol in 1621, equalled that of the Amati. Of modern names the best known is Vuillaume, of Paris. The latter city has also produced the most famous maker of V. bows, François Tourte (c. 1780). See Forster and Sandys, *His Story of the Violin*, 1864; E. Heim, *Neuere Führer durch die Violin-Litteratur*, 1901; A. Bachmann, *An Encyclopædia of the Violin*, translation by F. H. Martens, ed. by A. E. Wier, 1925; E. van der Straeten, *The History of the Violin*, 1933; and E. H. Allen, *Violin Making As It Was and Is*, 1946.

**Viollet-le-Duc, Eugène Emmanuel** (1814-79), Fr. architect and writer, b. in Paris. He studied under Leclerc, and travelled widely through France. In 1840 V. was charged with the restoration of many churches, gaining an immense reputation; in 1845 he gained, in competition, the work of restoring Notre Dame together with Lassus; and by 1853 he was acknowledged to be the greatest living architect. Later, he restored Laon Cathedral. In 1863 he became prof. at the Ecole des Beaux-Arts. He wrote many works, distinguished for vigour and polish, including a great *Dictionary of French Architecture* (1854-68), and *Histoire de l'habitation humaine* (1875). See life by U. Saint-Paul, 1881. His letters have been ed. by his son, 1902.

**Violoncello, or 'Cello**, see under VIOLIN.

**Vionville, or Mars-la-Tour**, vil. of the dept. of Moselle, about 12 m. W. of Metz. It is famous for the battle fought there between the Fr. and Gers. in 1870.

**Viper (Viperidae)**, family of poisonous snakes, most abundant in Africa and S.W. Asia. True Vs. (*Vipera*) have a characteristic flattened triangular head and relatively short thick body. The common V. or adder (*q.v.*) (*Vipera berus*) is the only poisonous Brit. snake. Others of

The rattlesnakes (*q.v.*) are also members of this family.

**Viper's Bugloss, or *Echium vulgare***, Brit. plant (family Boraginaceae) with bristly stems and leaves, and spikes of flowers which are at first rose colour, later turning to blue.

**Vipers, Pit**, see RATTLESNAKES.

**Vipsanius**, see AGRIPPA, MARCUS VIPSANIUS.

**Virbius**, Lat. divinity, said to have been the same as Hippolytus (*q.v.*).

**Virchow, Rudolf** (1821-1902), Ger. pathologist, b. at Schivelbeim, Pomerania. He studied medicine in Berlin, became lecturer at the univ. there in 1847, and, later, director of the Pathological Institute. He made a special study of the causes and cure of typhus. In 1858 he pub. his *Cellular Pathology*, which earned him the title of the 'father of modern pathology.' See lives by C. Pöchner, 1921, and H. E. Sigerist in *Grosse Ärzte*, 1931.

**Vire, tn.** in the dept. Calvados, France, with a castle built by Henry I. of England in the twelfth century. There is also the picturesque Tour de l'Horloge (thirteenth century). The tn. sustained heavy damage in the course of the battle of Normandy (1944). Pop. 5800.

**Virgil, Polydore**, see VERGIL.

**Virgil, Virgilius, or Vergilius Maro, Publius** (70-19 B.C.), Rom. poet, b. near Mantua in Cisalpine Gaul. He was educated at Cremona and Mediolanum (Milan), and he took the toga virilis at Cremona in 55. It is said that he subsequently studied at Neapolis (Naples) under Parthenius, a native of Bithynia, from whom he learned Gk. He was also instructed by Siron, an Epicurean, and probably at Rome. After completing his education, V. appears to have retired to his paternal farm. In the div. of land among the soldiers after the battle of Philippi (42) V. was deprived of his property, but it was afterwards restored by order of Octavian. V. probably became acquainted with Mæcenas soon after writing his *Eclogues*, in which Mæcenas is not mentioned. His most finished work, the *Georgics*, was undertaken at the suggestion of Mæcenas (*Georg.*, iii. 41); and was completed after the battle of Actium, 31 B.C., while Octavian was in the E. V. may have commenced the *Æneid* at this time. When Augustus was returning from Samos, where he had spent the winter of 20, he met V. at Athens. The poet, it is said, had intended to make a tour of Greece, but he accompanied the emperor to Megara, and thence to Italy. His health, which had been long declining, was now completely broken, and he d. soon after his arrival at Brundisium on Sept. 22, not having quite completed his fifty-first year. Besides the *Bucolics*, *Georgics*, and *Æneid*, sev. shorter pieces are attributed to V., which may possibly have been the productions of his youth. Such are the *Culex*, *Ciris*, *Copa*, etc. Of all his works the *Georgics* is both the most finished and the most original. The *Æneid* (*q.v.*) is the great national epic of the Romans. V. was by far the first of all the Rom. epic poets.

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the genus are the horned V. (*V. cornuta*) and Russell's V. (*V. Russellii*) of India, which causes many deaths. The horned V., a small sand coloured species with short horn-like projections above the eyes, is said to be the 'asp' of Cleopatra.

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Virginal, see HARPISCHORD, and under PIANOFORTE.

Virgines Vestales, see VESTAL VIRGINS. Virginia, "Old Dominion," one of the thirteen original States of the Amer. Union, bounded on the N. by West Virginia and Maryland, on the E. by the Atlantic Ocean and Maryland, on the S. by N. Carolina and Tennessee, on the W. by Kentucky and West Virginia. It has an area of 40,815 sq. mi. and is divided into: tidewater V., the low-lying region along the coast consisting of four peninsulas; the Piedmont, the central part rising to the Blue Ridge Mts.; the Shenandoah Valley between those mts. and the Alleghenies, a rich farming dist.; and S.-W. V., extending to the W. and including mts. and fertile valleys. Two thirds of the area of the State are given over to farming. Tobacco and apples are important crops; others are corn, winter wheat, cotton, and peanuts. Dairying, livestock (especially horses in the Piedmont), and turkey-raising are important. Among important industries are lumber and timber products, tobacco manufactures (Richmond is the world's largest cigarette centre), and flour and grist mill products; the State also produces large quantities of leather and cotton goods, boots and shoes, fertilisers, cars, foundry and machine-shop products, and iron and steel from blast furnaces. The chief mineral products are coal, stone, gravel, sand, and zinc, and others include titanium, cement, felspar, clay, lead-gypsum, manganese, mica, pyrites, and salt. The 1500 m. of tidal shore on the Atlantic, Chesapeake Bay, and the

entering rivs. have important fisheries, especially of oysters. The chief ports are Norfolk and Newport News, on Hampton Roads, formed by the estuary of the James, on which riv. stand Richmond, the largest city and cap., and other important cities. There are 25,750 ac. of State Parks, as well as the Shenandoah National Park in the Blue Ridge Mts. V. is famous for its educational institutions, including



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BUILDING

the Univ. of Virginia (see VIRGINIA, UNIVERSITY OF), Washington and Lee University, William and Mary College, Virginia Military Institute, and Hampton Normal School, the latter being the first school for Negro higher education estab. the S. The first permanent Eng. settlement was made at Jamestown in 1607 under the leadership of John Smith. In 1624 the charter formerly possessed by V. was revoked and V. became a crown colony. During the Fr. and Indian war Virginians saved Braddock's army from annihilation. V. took a leading part in the Revolution, and seceded with the S. States in 1861. The W. part of the State, which was against secession, broke away during the civil war and became the State of West Virginia. Leading cities are Richmond, 193,000; Norfolk, 144,300; Roanoke, 69,300; Portsmouth, 50,700; Lynchburg, 44,500; Newport News, 37,000; and Petersburg, 30,600. Pop. of the State, 2,677,700. See W. Stith, *History of the First Discovery and Settlement of Virginia*, 1865; T. J. Wertenbaker, *Virginia under the Stuarts (1607-88)*, 1914; H. J. Eckenrode, *The Revolution in Virginia*, 1916; R. A. Lancaster, *Historic Virginian Homes and Churches*, 1915; P. A. Bruce, L. G. Tyler, and R. L.

Morton, *History of Virginia*, 3 vols., 1924; and M. P. Andrews, *Virginia: the Old Dominion*, 1937.

**Virginia, University of**, most celebrated institution of learning in the S. of the U.S.A., opened in 1825 in Charlottesville, Virginia. Jefferson drew the architectural plans for the main semi-Gk. buildings, the beautiful campus, and the old serpentine brick walls. He also drew up the plans for the very liberal curriculum and invented the honour system whereby the students were not under supervision when writing their examination papers. Two other presidents of the U.S.A. were also connected with the univ., James Madison and James Monroe. The State grants the univ. an ann. sum and it now has endowments of over fourteen million dollars. In addition to the regular academic courses, law, medicine, and engineering are taught there. There are over 5000 students.

**Virginia Water**, dist. of Egham, Surrey, Eng. The lake, 1½ m. long, lies in the S. of Windsor Great Park, and was formed by the duke of Cumberland, the victor of Culloden.

**Virginia, West**, see WEST VIRGINIA.

**Virgin Islands**, The, group of three is., St. Thomas, St. Croix, and St. John, together with about fifty smaller ones, all in the W. Indies, and belonging partly to the U.S.A., partly (i.e., Anegada, Virgin Gorda, Tortola, Jost Van Dykes, Peter Is., Salt Is., and all others not in the possession of the U.S.A.) to Britain. Sugar, cattle, cay oil, and bay rum are the main products. The Amer. V. I. are under a governor, appointed by the president of the U.S.A., with the approval of the Senate; the legislative assembly is composed of the two municipalities. The Brit. V. I. form a presidency of the Leeward Is.

The V. I. were discovered by Columbus in 1493 and named after S. Ursula. The Eng. occupied Tortola in 1666 and have remained in occupation ever since. The Amer. V. I., St. Croix, St. Thomas, etc., were taken by the English from Denmark in 1801, restored in 1802, surrendered to the Eng. in 1807, and again restored in 1815. In 1917 they were bought by the U.S.A. from Denmark. Area of the Amer. is., 132 sq. m. Pop. 24,900. Area of the Brit. is., 58 sq. m. Pop. 5000.

**Virgin Mary**, see MARY, THE VIRGIN.

**Virgo**, sixth sign of the zodiac, ♍, and an anct. constellation, noted for its nebula, situated in the head and breast of which the spiral Messier 99 is the chief. The constellation is entered by the sun about Aug. 21. It was usually represented by a woman holding an ear of corn, Spica, and was identified in Egypt, probably from Chaldea, with the goddess Ishtar. It marked the Egyptian harvest time. It is also associated with Astraea, Demeter, and Persephone. Spica is of magnitude 1.2;  $\gamma$  Virginis—magnitude 3, is a binary with a period of 180 years, both variable;  $\epsilon$  Vindemiatrix is of magnitude 3;  $\eta$ , another spectroscopic binary, has a period of 72 days. There

are thirty stars of magnitude 4.4 to 5.2.

**Virgula Divina**, see DIVING ROD.

**Viroconium**, see WROXETER.

**Virtues**, see CARDINAL VIRTUES.

**Virtanen, Artturi Ilmari** (b. 1895), Finnish biochemist, b. at Helsinki and educated at a school in Viipuri and at the univs. of Helsinki, Zurich, Münster, and Stockholm. He taught organic chemistry at Helsinki from 1924, and in 1939 became prof. of biochemistry at the univ. there. In 1945 V. was awarded the Nobel Prize for chemistry. V. did extensive research on the effects of micro-organisms on the quality of food.

**Viruses**. Causative agents of many diseases in plants (e.g. tobacco mosaic, potato leaf-roll), in animals (e.g. foot-and-mouth disease, distemper, rabies) and in man (e.g. measles, smallpox, yellow fever, poliomyelitis). Most V. are too small to be seen under the ordinary microscope, though they can be studied by electron microscopy; the largest, such as that of psittacosis (q.v.) measure about 250 m $\mu$  (1 m $\mu$  = 1/1,000,000 millimetre) and are little smaller than some bacteria, whilst the smallest include such as poliomyelitis (10 m $\mu$ ) which is comparable in size with large protein molecules. Since they are able to pass through the pores of earthenware filters, the term filterable V. is often applied to them. The V. of animals appear to be living micro-organisms, but some of the plant V. have been obtained as crystalline proteins (e.g. tobacco mosaic V. in 1935 by Stanley) and must therefore be regarded as self-propagating enzymes. The discovery of V. dates from 1892, when Ivanowski showed that filtered sap of tobacco plants could transmit mosaic disease; in 1898 Loeffler and Frosch demonstrated the virus nature of foot-and-mouth disease, and they were followed by Reed in 1901 for yellow fever. Infection by V. takes place through the skin, as in warts, or through the mucous membranes, as in droplet infections of the respiratory tract, such as influenza; insect vectors are often important, for instance aphids in plant V. and mosquitos in Yellow Fever. One attack of a virus disease in mammals often conveys subsequent immunity (see SMALLPOX) though recurrent attacks of influenza and the common cold are frequent. See K. M. Smith, *The Viruses*, 1948.

**Visby**, see VISBY.

**Vischer, Peter** (c. 1460–1529), Ger. sculptor, b. at Nuremberg. In collaboration with his son Peter Vischer the younger (1487–1528), he executed a relief representing the coronation of the Blessed Virgin in Erturt cathedral, a tomb of Archbishop Ernest in Magdeburg cathedral (1497), and of St. Sebald at Nuremberg (1508–18), the latter being generally regarded as the sculptural masterpiece of the Ger. renaissance. See C. Headlam, *Peter Vischer*, 1901; and A. Feulner, *Peter Vischers Sebaldusgrab*, 1924.

**Visconti**, name of a noble Lombard family which for a long time held dominion over Milan. This lordship was practically estab. by Ottone, who was appointed to the archbishopric of that

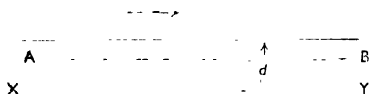
tn. in 1262. He drove out the opposing family of the Della Torre, and left his possessions to his nephew, Matteo. In the fourteenth century the V. were in constant conflict with the papacy. During this century the V. were supreme in Milan, and Galeazzo II. was of such importance that he was able to marry his daughter and son respectively to a son of Edward III. of England and the daughter of the Fr. king. He greatly befriended the arts, refounded a univ. at Pavia, and was a patron of Petrarch. He was succeeded by the joint sovereigns Barnabo and Gian Galeazzo, the latter of whom was the most powerful of all the V. He was finally made duke of Milan by the Emperor Wenceslaus. His brother, Filippo Maria, who succeeded him, and who was the last of the male V. line,  $d$  in 1447, being succeeded by Francesco Sforza.

**Visconti, Tebaldo**, see GREGORY (popes)

—Gregory X.

**Viscose Silk**, see under ARTIFICIAL SILK.

**Viscosity**, property of a fluid whereby it resists the relative motion of its parts. Thus, for example, when tea is stirred by a spoon, it is the V. of the tea that brings it to rest again. Viscous forces are merely frictional forces of a special kind. The tea comes to rest under the action of liquid friction between the layers of tea that are moving at different speeds relative to one another, and under the action of the liquid friction between the cup and the layer of tea next to it. Fluids like pitch, treacle, and heavy oils are highly viscous, but all fluids, and even gases, are viscous to some extent. The ideal 'perfect fluid' is non-viscous, but no real fluid is perfect. The special character of this fluid friction was guessed intuitively by Newton who formulated the law of V. that has stood the test of experiment. Newton's law is best explained in the following way. Suppose a stream of liquid is moving from left to right (see diagram) over a horizontal bed  $XY$ .



The velocity of any layer parallel to the bed depends on its distance above the bed; the layer next to the bed is at rest, while the surface layer is moving fastest. If we consider the layer  $AB$  we realise that the surface of the liquid immediately below it experiences a viscous force acting in the direction  $AB$ , tending to speed it up relative to the faster moving layer above it. The latter simultaneously experiences an equal and opposite viscous force in the direction  $BA$ , that acts as a drag on it tending to reduce its speed to that of the slower moving layer below it. As a result of these viscous forces the relative motion of the various layers will vanish unless there is some external force acting on the liquid to maintain the relative motion. Newton's law enables

us to compute the viscous forces acting in this liquid. Suppose the surface layer is moving with a velocity  $v$  parallel to the bed; the layer  $XY$  is at rest. There is

therefore a velocity gradient  $\frac{v}{d}$ , where  $d$

is the depth of the liquid. The viscous force per unit area of any layer parallel to

the bed is  $\eta \frac{v}{d}$ , where  $\eta$  is a constant for a

given fluid at a given temp., known as the coefficient of V. of the fluid. The direction of this force is parallel to the bed. When the moving parts of a machine are lubricated by means of a layer of oil the friction between the parts of the machine is greatly reduced. If, for example, the space between a plate moving over a fixed bed is lubricated by a film of oil whose thickness is  $d$ , the friction between the

plates will be  $\eta \frac{v}{d}$ , where  $v$  is the velocity of

the moving plate and  $\eta$  the coefficient of V. of the lubricating oil (see LUBRICANTS). Two examples serve to illustrate the V. of air. The vibrations of a pendulum are 'damped' by the air-friction on its surfaces, while the V. of air is sufficiently great to balance the weight of raindrops moving with a certain speed. Raindrops, therefore, on reaching this speed continue to descend with a uniform velocity. The kinetic theory of gases gives a satisfactory explanation of the V. of a gas. According to this theory there is a continuous exchange of molecules between any two layers of a gas. Hence if one layer is moving relative to the other, it receives slower moving molecules from the other layer and loses faster moving molecules to it. The effect is the same as if a viscous force acted across the surface; separating the two layers, tending to destroy their relative motion. See E. HATSCHEK, *The Viscosity of Liquids*, 1928.

**Viscount** (from Low Lat. *vicecomes*, 'in place of earl,' through O. Fr. *viscomite*), in the U. K. the title of the fourth degree of nobility, between earl and baron, first granted in England to John Beaumont in 1440. Originally the title was given to the deputy sheriff, who acted on behalf of an earl within his estate.

**Viseu**, see VIZEU.

**Vish**, see BIKI.

**Vishinsky, Andrei Januarevich** (b. 1883), Russian lawyer and politician, b. at Kiev of Polish descent. He studied law at Kiev, joined the Mensheviks, and was in gaol for a year. In 1920 he was a member of the Communist party, and first became prominent as president of the Supreme Court. He was prof. of jurisprudence at Moscow (1925-7), and deputy public prosecutor (1933-9) securing over six thousand death sentences in the trials of 1937-8. In 1940 V. became deputy people's commissar for foreign affairs. He attended the Potsdam conference of 1945, and led the Russian delegation to the United Nations General Assemblies (1946-8), becoming noted for constant opposition to the W. powers. In 1947 he gained the Stalin prize for his work

in legal science, and in 1949 became Foreign Commissar.

**Vishnu**, occupies the second place in the Hindu Trimurti (*q.v.*) or Triad (*q.v.*). He embodies the preserving principle, and his worship is of very anct. date, and to-day he is often worshipped as the superior of Brahma. V. has undergone a number of Avatars or Incarnations, the number given being various. His two most famous incarnations are those as Rama and as Krishna. Under the latter form he is the hero of the great poem, the *Mahābhārata*.

**Visibility**, term used in meteorology and aviation to describe the transparency of the atmosphere. It is the horizontal distance to the furthest object that can be recognised; after dark the equivalent daylight distance for the same atmospheric obscurity is used. Even with lights at various known distances it is not easy to estimate this distance after dark for, quite apart from the marked differences in the ability of different human eyes to see faint lights, even when well accommodated to the darkness, a powerful light can be seen at a greater distance than a weaker one with the same obscurity. Allowance for the power of the light is therefore made in measuring V. at night. It is for this reason that searchlights and lighthouses, which concentrate the light into beams, can be seen at much further distances than naked lights of the same strength.

In looking at a black object at a distance, the light from the sun (either direct, diffused through clouds or reflected from the ground) is scattered by air molecules and other small particles between the observer and the object so that the object does not appear completely black. This apparent brightness depends on the amount of scattering between the observer and the object which therefore appears less bright than the background for there must be more scattering in the greater distance between the observer and the background. At the V. distance this difference can just be distinguished; at greater distances it cannot. V. is therefore a rough but practical measure of the number of scattering particles or impurities in the atmosphere, for most scattering is produced by particles consisting of solutions of hygroscopic nuclei, which are absorbed into the atmosphere mainly from smoke. Mist and rain drops by diffuse reflection and refraction have a similar effect to scattering but more pronounced; when the water droplets are very numerous the V. is very low being defined as mist when below 2 km. (2200 yds.) and as fog when below 1 km. (1100 yds.). Fog and mist are most likely when the air is at its dampest, i.e., when coldest just about sunrise (see *further under Fog*). In relatively dry air the worst V. is probably experienced in and near tns. at about eight o'clock in the morning when most domestic fires are being lit and when the air is at its most stable and quietest so that the pollution is not carried away. The best V. occurs in clean arctic or polar air or in high mt. regions.

**Visigoths**, see *under* GOTHs.

**Vision**. Sensory nerve fibres are very fine cylindrical threads, ending outwardly in the sensitive surfaces and sense organs, and inwardly in the nerve centres, especially the brain. Impressions on their outer extremity are transmitted along the fibre with a velocity of about 100 ft. a second and determine changes in the nerve centres which in turn may determine changes in consciousness or sensation (*q.v.*). The optic nerves are organised to respond to the ethereal vibrations called light (*q.v.*) and nothing else. If, therefore, those nerves be mechanically irritated, nothing is felt, but a flash of light is seen. All the higher senses may be regarded as the result of refinements of common sensation, each a more refined touch. In sight, objects are perceived at a distance which is illimitable, the vibrations being conveyed by a medium which is universal and too subtle to be recognised except as the bearer of light. The direct data of V. or sight, and what are added by the mind as judgments based on such data must be distinguished. The direct data are only light, its intensity and colour, and direction. These, being incapable of further analysis, are simple sensations. But size and distance and solid form, though they may seem to be perceived, are not direct perceptions, but only very simple judgments based on these data (for the general structure of the eye see *under EYE*).

**Formation of Images**.—The eyeball may be regarded as consisting of two distinct portions: a nervous expansion, the *retina*, which responds to light-vibrations, and an optical instrument, the *lens apparatus*, placed in front of the retina, and arranged to make the impression of light strong and definite by means of an image. These two portions entirely differ in their embryological origin, but they meet and unite to form the eyeball, the sole object of which is the formation of a perfect image on the retina. Without images, light could be perceived, but not objects, and the distinctiveness of objects is exactly proportioned to the distinctiveness of retinal images. Hence a serviceable image must be sufficiently bright and perfectly sharp and distinct in outline, and in order to be perfectly distinct it is necessary that rays from different points in the object, even the most contiguous, should not mingle on the image, but that all the rays from each point on the object should be carried to its own point on the image, conditions which can only be fulfilled by the arrangement found in the eye.

**Colour Vision**.—The sense by which the eye distinguishes and recognises colours. According to the Young-Helmholtz *Trichromatic* theory of colour V. there are three kinds of sensory cones in the retina. When excited they produce the sensation of red, green, and violet respectively. A sensation of white is produced when the three types of cones are excited to the same extent, while other colour sensations are produced by the excitation of the three kinds of cones to different extents. In addition, there are sev. modifications



of the Trichromatic theory by V. Kreis, McDougall, and Roaf.

In opposition are a group of theories known as the Tetrachromatic Theories based on Newton's discoveries, supporters of which are Hering, Lodd-Franklin, Müller, and Edridge-Green.

**Colour Blindness.**—See COLOUR-BLINDNESS.

**Vision and colour sense in animals.**—The structure and functioning of the eye in other mammals, and indeed in all vertebrates, resembles in general that of man, though reptiles, amphibians, and fishes accommodate for objects at varying distances by a backward and forward movement of the lens instead of by a change in its shape. Amongst invertebrates a true eye capable of forming images is confined to the molluscs such as the cuttlefish (which has a pair of eyes of curiously human aspect) and the arthropods (insects, crustaceans, etc.). Many other invertebrates, as for instance the common earthworm and even some unicellular organisms, are sensitive to the difference between light and darkness.

The extent to which animals apart from man are able to distinguish various colours is still under investigation. Much early work is of little value, owing to the failure to differentiate between colour and brightness: an animal may be sensitive to a certain colour simply because that colour is brighter than the surroundings. Colour vision certainly occurs in birds, bony fish, some reptiles, and in primates. The majority of mammals (including for example dogs and cats but excluding primates) are probably colour blind, despite the popular belief that red is a distinctive colour to bulls. Amongst insects the work of von Frisch has shown that the honey bee can distinguish blue and yellow, but not green or red, so that it resembles in its colour sense the commonest type of colour-blind human individual.

**Erect Vision.**—Retinal images are all inverted. External images or signs of objects are outward projections of retinal images. Yet they are not seen inverted owing to the 'law of visible direction,' which may be thus stated: 'When the rays from any radiant strike the retina, the impression is referred back along the ray-line into space and therefore to its proper place.'

**Single and Double Images.**—The preceding paragraphs proceed on the assumption that V. is monocular. The phenomena of binocular V. are less purely physical than those of monocular V. There being two retinæ, there are two retinal images of every external object, and since retinal images are projected outward into space as external images, there must be two external images of every object. In fact, all objects are seen double, except under certain special conditions. This can be proved by simple experiment, e.g. point with the forefinger at some distant object, looking with both eyes at the object, not the finger. Two fingers will be seen, one of them pointing at the object and the other far out of range, usually to the

right. It is evident that any object looked at directly is seen single, but that all things nearer or beyond the point of sight are seen double. But an object is seen single when the two images of it are projected outward to the same spot in space, and are therefore superimposed and coincide. Under all other than these special conditions objects are seen double. The two external images of an object are thrown to the same spot and thus superimposed and seen single when the two retinal images of that object fall on what are called corresponding points or identical points of the two retinæ; if they do not fall on corresponding points of the two retinæ, then the external images are thrown to different places in space, and therefore seen double. All the phenomena of binocular V. are explained by the 'law of corresponding points,' for which see any text-book.

**Horopter.**—If any point is looked at, the two visual lines converge and meet at that point. Its two images therefore fall on corresponding points of the two retinæ, viz. on their central spots. A small object at this point of convergence is seen absolutely single. All objects beyond this, the point of sight, are seen double (in the one case homonymously, in the other heteronymously) because their images do not fall on corresponding points of the two retinæ. But objects below or above or to one side or the other of the 'point of sight' may possibly be seen single also. The sum of all the points which are seen single while the point of sight remains unchanged is called the horopter. The nature and form of the horopter have given rise to much controversy.

See also BLIND SPOT.

See J. H. Parsons, *Introduction to the Study of Colour Vision*, 1924; J. H. Parsons, *Introduction to the Theory of Perception*, 1927; C. L. Walls, *The Vertebrate Eye*, 1942; W. D. Wright, *Researches in Normal and Defective Colour Vision*, 1946; J. H. Prince, *Visual Development*, 1949; and H. H. Emsley, *Visual Optics* 1936, 1946.

**Vision, Defects of.** These may be due to affections of the nervous mechanism of the eye, to inflammatory and other changes in the transparent media through which light passes, or to errors of accommodation or co-ordination. The optical mechanism of the eye and the D. of V. arising from defective refraction are discussed in the articles on EYE and REFRACTION, ERRORS OF. Pathological causes that produce defective vision are so numerous as to require the attention of specialists in medical practice. Tumours in the brain may cause impairment of function of part or the whole of the visual centre. Thus a lesion may cause hemianopia or half-blindness, one side of the visual field in each eye being affected. Toxic influences, such as that of tobacco, are usually responsible for Amblyopia (q.v.), in which the visual impressions are dimmed. Paralysis or inflammation of the optic nerve may cause total or partial blindness. Glaucoma (q.v.), is a condition

caused by a rise of pressure inside the eyeball; various visual defects are experienced, which may proceed quickly or gradually to total blindness. Glaucoma may be chronic, acute, or pathological. Keratitis, or inflammation of the cornea, is the result of injury or is secondary to conjunctivitis. Opacity of the lens is known as cataract (*q.v.*); it may be due to injury, to degeneration of the tissues in old people, or to altered nutrition. Iritis (*q.v.*), is a painful and dangerous condition dependent on a variety of causes, such as injury, constitutional disturbances of various kinds, extension of inflammation from other structures, etc. Conjunctivitis (see CONJUNCTIVA AND CONJUNCTIVITIS) may be catarrhal or purulent; most varieties are contagious, hence the necessity for care in dealing with discharges from a diseased eye. When the two eyes are not co-ordinated, a condition of diplopia or double-vision exists; this is due to an affection of the oculomotor nerves. See also BLIND, *Blindness and Causes of Blindness*; COLOUR-BLINDNESS; EYELIDS, SORE, or BLEPHARITIS; MYOPIA; PINK EYE; SQUINTING; TYTE; TRACHOMA; VISION.

For the treatment of wounds and foreign bodies in the eye see under EYE, and for sight-testing, see under REFRACTION, ERRORS OF.

Visions, see APPARITION, SPIRITUALISM, THEOSOPHY.

**Visit and Search**, in international law the right inherent in all belligerents in time of war to stop private or mercantile vessels carrying the flag of a neutral state, and being within the territorial waters (see TERRITORIAL WATERS JURISDICTION) of the belligerent or his enemy, in order to ascertain whether such vessels are in fact neutral. Warships are not the subjects of this right. The right is exercised by sending an officer on board the suspected vessel to examine the register (see MERCHANT SHIPPING ACT), the log, invoices, and charter-party and other ship's papers, so as to satisfy himself that both the character of the ship and the nature of her cargo are neutral. From the Parliamentary Papers relative to the Declaration of London (*q.v.*) it seems, that the Brit. point of view yielded to the Continental doctrine that the 'neutral vessels under national convoy are exempt from search.' Resistance to V. and S. justifies capture. If V. and S. are impracticable at sea, in view of the conditions of modern warfare, a vessel may be taken into harbour for the purpose.

In the Second World War, after July 1940, all neutral ships proceeding to European shores had to possess a navicert (*q.v.*), or otherwise both ship and cargo were liable to seizure by the R. N. See Parliamentary Papers Misc. No. 6 of 1915 and No. 15 of 1916. See also Hall, *International Law*, 1924; Birkenhead, *International Law*, 1927. See also BLOCKADE, and CONTRABAND.

**Visitation, Order of the**, see under FRANCIS OF SALES, St.

**Visitation of the Blessed Virgin Mary**, Feast of the, festival held in the W. Church

on July 2 to commemorate the visit paid by St. Mary to her cousin Elizabeth.

**Visitor**, officer or superior whose duty it is to visit a corporation, civil or eccles., in order to see that its rules and regulations are being observed, and that there is no serious default. The visitation of civil corporations is the work of the crown, which acts through the medium of the court of King's Bench. The bishop is the V. of his diocese; but, on account of the number of par., the visitation is usually left to the archdeacons.

**Vistula** (Ger. *Weichsel*, Polish *Wisla*), one of the largest rivs. of Europe, rises in the Beskid Mts. (altitude 3675 ft.) in Austrian Silesia, and flows in a N.W. direction to Schwarzwasser, afterwards passing Cracow, whence it is navigable to its mouth at the Frisches Haff in the Baltic. Its chief tribs. are: on the right, the Drewenz, Ossa, Liebe, and San; and on the left, the Przemska, Pilica, Brahe, Forse, and Radaune. Length 652 m. For battles of 1944 on the V. in the Second World War, see under EASTERN FRONT or RUSSO GERMAN CAMPAIGNS IN SECOND WORLD WAR.

**Vital Statistics**. The Brit. birth-rate in 1947 was 20.3 per 1000 (the highest since 1921), which rate was not maintained in 1948. Most European countries have birth-rates between 17.8 and 23.9, except Finland (27.4) and the Netherlands (27.8); the Dominion birth-rates are from 24.1 in Australia to 28.6 in Canada; that of the United States (1946) is 22.3; and the birth-rate in Japan jumped from 25.3 (for Jap. nationals in Japan proper) to 31.8 in 1947 for the whole of Japan, the highest there since 1923. In 1946, for the first time for eleven years the Fr. birth-rate was higher than the death-rate.

*Royal Commission on Population, 1944.* --This Commission was appointed to inquire into the facts concerning Brit. pop. trends, their causes and probable consequences; and to 'consider what measures, if any, should be taken in the national interest to influence the future trend of population.' Surveying the growth of Britain's pop. from about 7 million in 1700 to 49 million to-day, the report of the Commission (pub. in June 1949) concludes that reductions in the death-rate were the main influence making for expansion of numbers. The rate of increase has slackened because the birth-rate, starting to drop in the 1870's, came to fall faster than the death-rate. This fall in births is not due to any change in the proportion of people marrying but to a decline in the number of children born per married couple. Holding any marked increase or decrease in Britain's pop. alike undesirable, the Commission urges a national effort to raise the average family size from 2.2 to 2.4 children, just sufficient to secure replacement.

Such a change is not likely to come about of its own accord without deliberate encouragement. The increase in births since 1941 does not, on analysis, clearly point to an enlargement of family size. Most of the additional children born in 1941-47 seem to have been either 'arrivals'

from earlier years (births postponed owing to the outbreak of war) or 'borrowings' from the future (births brought forward for various war-time and immediate post-war reasons). The Commission also found that the early stages of the decline in family size went on fastest among the higher occupational categories. Among couples married between 1900 and 1930 the families of manual workers have consistently been about 40 per cent larger than those of non-manual workers, the average for the most recent groups being 2.5 children for the manual workers and as low as 1.7 for the non-manual group.

The table shows that the reduction of 60 per cent in the size of families between the mid-Victorian era to the period 1925-29 has been achieved by the substitution of one and two child families for families of five, six, or seven children as the most common sizes of family and by the virtual disappearance of families of more than six children which formerly were very numerous.

DISTRIBUTION OF FAMILIES BY SIZE

Number of children born	Marriages taking place about 1860 (1911 Census of England and Wales)	Marriages of 1925 (Great Britain, 1946 Family Census)
	Per cent	Per cent
0	9	17
1	5	25
2	6	25
3	8	14
4	9	8
5	10	5
6	10	3
7	10	2
8	9	1
9	8	0.6
10	6	0.4
Over 10	10	0.3

Disregarding the effects of emigration and immigration the Commission predicts with confidence that:—(i) total numbers will continue to grow slightly in the near future, perhaps for another generation. (ii) The pop. of working age will remain at about its present size for at least the next 30 years, though it will come to form a somewhat smaller proportion of the total. (iii) The pop. of young adults (15 to 39) will show a fall of about 1,400,000 in the next 15 years. (iv) The number of old people (over 65) will grow steadily over the next 30 years, the increase amounting to at least 2,300,000 and very probably much more. The proportion of old people to the total will increase considerably. The death-rate in 1948 was 10.8 per thousand, the lowest ever recorded, while the infant mortality rate, of 31 per thousand, fell below 40 for the first time.

**U.S. Vital Statistics.**—The U.S. birth-rate (per 1000) in 1946 was 23.3, i.e. a total of 3,288,672 births. Preceding rates were: 1920, 23.7; 1925, 21.3; 1930, 18.9; 1935, 16.9; 1940, 17.9. The highest rate

occurred in New Mexico (34.9), and the lowest in Oregon (20.8). The number of deaths was 1,395,617, a rate of 10.0. Preceding rates were: 1920, 13.0; 1925, 11.7; 1930, 11.3; 1935, 10.9; 1940, 10.7.

**Vitamins** are accessory food factors essential to growth. Lunn (1881) discovered that animals could not be reared on adequate supplies of proteins, fats, carbohydrates, and mineral salts. Subsequently Sir F. Gowland Hopkins (q.v.) estab. the presence of accessory factors in milk. For these Funk suggested the name vitamins, as he considered them to be amines. Although considerable research was carried out, the chemical nature of the accessory factors long remained undetermined and they were consequently collectively named *vitamins*, and separately distinguished alphabetically as A, B, C, D, E., etc. About 15 are now known.

**Vitamin A**, the fat-soluble V., occurs in cod-liver oil, fresh eggs, animal and fish fat, liver, green vegetables, tomatoes, germinating grain, fresh milk, cheese, and butter, and is destroyed by heating for six hours at 100° C. Deficiency of this V. results in diminished growth, xerophthalmia, and night blindness.

**Vitamin B**, the anti-neritic V., is contained in yeast, legumes, unmilled cereals, eggs, milk, liver, nuts, green and root vegetables. Foods containing it may be dried, cooked, or preserved in this (variable) without destroying the V.

**Vitamin C**, the anti-scorbutic water-soluble V., occurs in fresh lemons and orange juice, tomatoes, green salad, rhubarb, radishes, rose hips, and in small quantities in other fresh fruits and vegetables, germinating legumes, and milk. Boiling and drying greatly reduce the efficiency of the V., and consequently scurvy was for years prevalent in the Brit. navy. In the sixteenth century lemon juice was recommended as a cure for scurvy.

**Vitamin D**, the anti-rachitic V., is more stable than A, prevents rickets and osteomalacia, and is present in irradiated ergosterol, cod-liver oil, germinating grain, fresh vegetables, butter, and milk.

**Vitamin E**, the anti-sterility V., occurs in wheat and other cereal embryos, yolk of eggs, fresh vegetables, lean meat, liver, and milk. It is very stable and has been proved to prevent sterility in both sexes, is essential to lactation, and promotes the utilisation of salts of iron.

The following foods are without V. (unless V. are deliberately added); tinned, salted or potted meats, meat extracts, white fish, white flour, white cornflower, polished rice, pearl barley, tapioca, sago, vegetable margarine, lard, olive oil, tea, coffee, cocoa, sugar, jam, etc. See H. K. Rosenberg, *Chemistry and Physiology of the Vitamins*, 1945; F. Bicknell and F. Prescott, *The Vitamins in Medicine*, 1946; and P. Karrer, *Organic Chemistry*, 1947 ff.

**Vitebsk:** 1. Region of the Byelorussian S.S.R. During the twelfth and thirteenth centuries the area was an independent prov., but was conquered by the Lithuanians in the fourteenth century. The

country is undulating and marshy, lakes being a typical feature of the physical structure. It is fertile; large crops of corn, rye, flax, and potatoes are raised. The timber trade is of great importance, and there are saw mills, flour mills, and paper mills. The greater part of the pop. are White Russians. 2. Cap. of the above, situated on the W. Dvina, about 78 m. N.W. of Smolensk. It is a cathedral tn., and has many fine churches. It is the centre for a number of light industries, especially linen and woollen textiles, and knitted goods; it also manufs. candles and tobacco. Pop. 167,400.

In the Second World War, V. became a key point in the battles on the central (E.) front following the fall of Smolensk to the Russians (Sept. 1943). See further under EASTERN FRONT, OR RUSSO-GERMAN CAMPAIGNS IN SECOND WORLD WAR.

**Vitellius, Aulus** (A.D. 15-69), Rom. emperor. He became the commander of the Rom. legions on the lower Rhine. In A.D. 69 he was proclaimed emperor by the legions, but when Vespasian was proclaimed he was murdered.

**Viterbo**, tn. in the prov. of Rome, Italy, about 41 m. N.W. of Rome. It is encircled by old Lombard walls, and contains Etruscan antiquities. Damage was caused to sev. churches and anc. buildings during the Second World War. Pop. 37,100.

**Viti Levu**, see under FIJI ISLANDS.

**Vitim**, riv. of Siberia, a trib. of the Lena (q.v.), rising in the Baikal mts. and joining the Lena at the tn. of Vitimsk. Of its length of 1192 m., some 340 m. are navigable.

**Vitis**, genus of creeping or climbing shrubs (family Ampelidaceae) with small fragrant flowers followed by berries. *V. vinifera* is the vine (q.v.).

**Vitoria**: 1. or **Vittoria**, episcopal city, cap. of Alava prov., N. Spain. Its cathedral dates from 1181. It is the site of Wellington's decisive victory over the Fr. on June 21, 1813. Pop. 11,300. 2. Tn. of Brazil, cap. of the State of Espírito Santo. It exports coffee, cacao, and other tropical produce. Its industries are sugar refining, cotton weaving, and the manuf. of footwear and mineral waters. Pop. 50,000.

**Vitreous Rocks**, see under IGNEOUS ROCKS.

**Vitrified Forts**, term often applied to the Gallic stone rampart camps of the latter part of the Early Iron Age in the highlands of Scotland. Finavon, near Fortar, is an example which has been excavated by modern archaeological methods. The ramparts, faced with roughly squared blocks of stone, are tied to a rectangular lattice of timber beams filled with rubble. The beams have often been completely burnt, intentionally or by accident or in war, and the filling of rubble has thus become a vitrified mass.

**Vitriol** (Lat. *vitrum*, glass), certain metallic sulphates that form glassy crystals. Blue V. is copper sulphate, white V. is zinc sulphate, green V. (copperas) is ferrous sulphate. Oil of V. is sulphuric

acid. See SULPHURIC ACID; COPPERAS ZINC.

**Vitriol, Oil of**, see SULPHURIC ACID.

**Vittoria, Duca della**, see DIAZ, ARMANDO.

**Vittoria**: 1. Tn. of Ragusa prov., Sicily, on the Camarino, founded (1605) and named after Vittoria Colonna. It trades in wine. Pop. (with Scoglitti) about 43,600. 2. City of Spain, see VITORIA.

**Vittorio Veneto**, tn. of Treviso prov., Venetia, Italy, formed about 1879 by union of the tns. Ceneda and Serravalle. Silk and cement are manufactured, and there are saline and sulphur springs. V. was captured in 1917 and retaken by the Allied forces in Oct. 1918 (See next article). Pop. 23,500.

**Vittorio Veneto, Battle of**, Oct. 21-Nov. 4, 1918. This battle of the Piave line (Italy) brought about the rout and surrender of the Austrian forces during the First World War. The summer campaign of 1918 was very successful for the Allies, who had forced the Austrians back to W. of the Piave. The Brit. force under Lord Cavan was on the left of the line. An advance was made during Oct. which drove the Austrians back to the Livenza, and towards the end of the month the Brit. were about Ramora. A further advance in a N.E. direction towards Sacile broke the Austrian line and separated the Austrians in the mts. from those in the plain. See further WORLD WAR, FIRST (DISINTEGRATION OF AUSTRIA-HUNGARY).

**Vitus**, Rom. saint who suffered martyrdom under Diocletian. His aid is invoked against St. Vitus's Dance (*Chorea*), hydrophobia, and other complaints, and he is the patron saint of dancers.

**Viverra**, see CIVET.

**Vives, Juan Luis**, more commonly known as Ludovicus Vives (1492-1540), Sp. scholar and educationist, b. at Valencia. He became prof. of humanities at Louvain (1519), and four years later was appointed tutor to Princess Mary of England, for whom he wrote *De ratione studii puerilis epistolae duae* (1523).

**Vivisection**, dissection of, and experiment upon, living animals. In its present legal sense, the term V. is limited to vertebrates. V. is an anc. practice, Galen being one of its exponents. It is claimed that by V. alone was it possible to discover much physiological and pathological knowledge, e.g. the circulation of the blood and the value of therapeutics. This, however, is denied by many, who say that nothing has been discovered with the aid of V. that could not have been discovered without it. See further under ANTI-VIVISECTION.

**Vivonne, Catherine de**, see RAMBOUILLET.

**Vizagapatam**, port and cap. of a dist. of the same name in Madras, India, situated on the E. coast. Manganese ore, rice, etc., are exported. Pop. 70,200. In the dist. of V., rice, sugar-cane, tobacco, and cotton are grown. Area 9107 sq. m. Pop. 3,846,000.

**Vizcaya**, prov. of Spain, bordering the bay of Biscay, in the Basque country.

Bilbao is the cap. Area 836 sq. m. Pop. 559,200.

**Vizeu, or Visou:** 1. Dist. of Portugal in the prov. of Beira. Area 1933 sq. m. Pop. 465,600. 2. Cap. of the above, 50 m. from Oporto. It has a twelfth-century cathedral and remains of the Rom. Campo de Viriato near by. Pop. 10,000.

**Vizier** (Arabic *Wazir*), title first given to the chief minister of the Abbaside caliphs, and since spread among most Oriental nations.

**V. J.-Day**, Aug. 15, 1945, on which, with Aug. 16, was celebrated the defeat of Japan in the Second World War, the Jap. having formally accepted, on Aug. 14, terms of unconditional surrender.

**Vladimir I., Grand Duke of Kiev**, called also **St. Vladimir** (956-1015), warrior prince of Russia. Before his marriage to the sister of the Byzantine emperor V. was baptised, and he called in the Gk. clergy to evangelise his country. He is the patron saint of Russian Catholics.

**Vladimir:** 1. Region of the R.S.F.R.S., to the E. of the Moscow Region. 2. Cap. of the above, on the R. Kyazina and an important riv. port. It has dye-works and linen and cotton manufs., and produces tiles and precision instruments. Pop. 66,800.

**Vladivostok**, city of the Primorye Ter. of the R.S.F.S.R., and an important naval port on the Pacific. It is the E. terminus of the Trans-Siberian Railway. Being the only large Soviet port on the Pacific, V. has considerable strategic and commercial value. It is the headquarters of the Far E. army, and the chief Russian Pacific naval base. It is provided with excellent harbour facilities on the shores of a fine bay. V. is also the terminus of the N. sea-route and the centre for communications with the scattered settlements of N.E. Siberia. V. is a main centre for the sea fisheries and for fish canning, and its mechanised canneries produce about 200,000,000 tons of preserved fish annually. The tn. has a large modern refrigerating and cold storage plant. V. is also one of the important centres of new industrial regions. The first electric power station in the entire Far E. was that constructed at V. The chemical, textile, and shipbuilding are its chief industries; next in importance are flour-milling, food-processing, copper refining, tanning and leather manufacturing. In winter V. is closed from mid-Dec. until April, and the coast further N. for considerably longer. Pop. 206,400.

**Vissingen**, see FLUSHING.

**Vlonë**, Albanian name for Avlonya (q.v.).

**Vocalisation.** As a phonetic term, V. would indicate the action of making vocal or sonant, i.e. of forming voice sounds, or the modes of utterance or pronunciation of voice sounds, esp. of vowel sounds. As a musical term, V. indicates the use of singing voice, the action of producing musical sounds with the voice, especially singing to vowel sounds. As a graphic term, V. means vowel-representation in consonantal alphabets (such as Heb.,

Arabic, Syriac, and other Semitic alphabets). The absence of vowel-letters is not as strongly felt in Semitic as, e.g. Indo-European languages, because the former are essentially consonantal, and the vowels serve principally to denote grammatical variations. However, in the seventh to eighth centuries, subsidiary and inadequate systems of V. or vowel-representation were introduced in Syriac, Heb., and Arabic, consisting mainly in diacritical marks (dots, little dashes, etc.). See also under ALPHABET, HEBREW LANGUAGE AND LITERATURE, VOICE AND VOICE TRAINING.

**Vocational Training** covers those schemes of education which aim at preparing the young for industrial and commercial pursuits. (See TECHNICAL EDUCATION.) Many employers arrange for entrants to their works to spend part of the working day at municipal institutions, but other business organisations have their own schools, and much money and care are expended in their administration, particularly in England and Germany, where the schools are called 'works schools.'

The system is highly organised in the U.S.A. The Federal Gov. gives aid to public schools which organise V. T., with the proviso that commercial subjects be excluded. In the U.S.A. the Young Men's Christian Association develops a scheme of trade apprenticeship on similar lines. See D. C. Thomson (ed.), *Training Worker Citizens*, 1919; and F. Twyman, *Apprenticeship for a Skilled Trade*, 1944.

**Vodka**, Russian brandy, the national spirituous drink of Russia. Originally it was distilled from rye, but maize and potato spirit are often used. It contains about 50 per cent of alcohol.

**Vogesus**, see VOSGES.

**Voghera** (anc. Iria), tn. of Pavia prov. Lombardy, Italy, 16 m. from Pavia, on the Staffora. Silk, corn, and wine are produced. Pop. 30,200.

**Vogt, Alfred** (1879-1943), Swiss ophthalmologist, b. at Aarau. He perfected the technique of microscopic study of the eye, and was a world authority on the cure of diseases of the eye.

**Voice and Voice Training.** *The Singing Voice.*—The vocal cords, set horizontally in the larynx, do not actually create sound; they produce eddy currents (vortices) as they open and close, one eddy or vortex at each complete vibration to and fro. A vowel is merely shaped vibration. Every vowelised tone has a central core or main stream called sound column (a better term is sound-beam). The sound-beams of the different vowels, and the different directions they take, are the singer's most valuable 'tools.' Voice training, therefore, must include accurate knowledge of the behaviour of these beams, varying as they do in width, height, and location (tonal focus or tuning) according to the pitch and vowel.

The categories of voice are: soprano, mezzo, contralto, tenor, baritone, bass (including the *basso cantante*, singing bass actually a big baritone with a bass time running through the entire voice). Each category is distinguished by the charact-

eristic timbre or quality of the voice, never by its compass. Pitch is raised on an ascending chromatic scale by a triple action of the vocal cords: they get gradually shorter and thinner with a corresponding gradual increase in tension. Only in the completely natural voice is this triple action mechanically perfect; in most voices the master's art steps into the breach to complete the mechanical three-fold action of the cords.

The main stream of the tone (sound column or beam) will take the right direction and 'tune in' to the exact point within the resonating zone to which the particular pitch belongs acoustically, provided the singer allows it to do so through appropriate vowel shaping in relation to pitch. This is the natural 'placing' of the voice. And as the direction, height, and location vary according to pitch and vowel, it is highly detrimental to 'place' or thrust indiscriminately all tones (all pitches, all vowels) 'well forward on the lips, teeth, or mask,' for that spells strain and distortion. The singer must learn to discriminate between tonal focusing and reverberation; the former is of paramount importance. To relax everything except the vibrating element and adjacent parts, and the breathing apparatus, in order to give free play to the upsoaring tonal stream or beam, is a highly important factor in singing.

*The Speaking Voice.*—The use of the voice in song and in speech is dependent on the same physiological principles. The four factors of vocal tone are: the breath; the note; the tone; the articulation. Speech is acquired entirely through the ear, and its musical elements remain under the control of the ear. In imitating the sounds heard the auto power of making audible movements is developed, and these movements give a feeling of right speech. There is an auditive and a kinæsthetic element in speech. Breathing for the speaking voice needs to be even more easy and controlled than for song. The note is produced by the outgoing air vibrating the two small membranes called vocal cords. In speaking, the note is constantly gliding up and down the scale; in song it moves by quick steps and its pitch and duration are exactly measured; it is therefore essential to train the speaking voice, so that the ear may grow to appreciate differences of pitch and musical quality. The range of the speaking voice is roughly from A to A in women, and an octave lower for men. The vowels result from the resounding of the air in the neck, throat, and mouth. They can be whispered without voice, when they will be found each to have a specific pitch. For the vowel sounds, see under PHONETICS. See A. Randegger, *Singing*, 1878; A. B. Bach, *The Principles of Singing*, 1885; Sir R. Paget, *Human Speech*, 1930; W. W. Shaw, *Voice Production*, 1930; T. H. Pear, *Voice and Personality*, 1931; Blanche Marchesi, *A Singer's Catechism and Creed*, 1932; E. Herbert-Casari, *The Science and Sensations of Vocal Tone*, 1936; and *The Voice of the Mind*, 1950.

**Voile**, fabric of cotton, wool, or silk, with a fine open mesh.

**Vojvodina**, federal unit of Yugoslavia. Set up by the 1946 constitution, V. lies in N. Serbia corresponding generally to the pre-1918 Banat. The cap. is Novi Sad. Pop. 1,661,600.

**Volapük**, see under ESPERANTO; IDO.

**Volaterræ**, called by the Etruscans, **Velathri**, one of the twelve cities of the Etruscan Confederation. Its dominions extended eastwards to Arretium, westward to the Mediterranean, and southward to its colony Populonia. Its influence was due mainly to its ports, Luna and Populonia. The modern tn. contains interesting Etruscan remains.

**Volcae**, Celtic tribe of Gallia Narbonensis, who lived in the region between the Pyrenees and the frontiers of Aquitania along the coast as far as Rome. They were autonomous, were not subject to the Rom. provincial governor, and also possessed the Jus Latii. Their chief tn. was Tolosa (modern Toulouse).

**Volcano**. A V. is a vent in the earth's crust from which lavas and ashes, etc., are ejected. If the vent is in the form of a fissure it is not commonly called a V. The term V. is generally restricted to those conical mts. which are built up by material ejected from a fissure by means of a central throat or pipe. At the top of the cone is a pit-shaped opening called the 'crater.' Vs., however, exhibit two prin. types of eruption: (1) the explosive type; (2) the quiet type. In the former the materials are ejected with explosive violence, while in the latter the lava rises up into the crater and flows over the rim or breaks through the sides. Of the first type the best known are Vesuvius (q.v.) and Stromboli.

Smaller volcanic cones exist in the Phlegrean Plain near Naples, and these, nearly extinct, discharge only carbon dioxide and sulphurous gases. This stage is known as the sulfatario stage. The eruption of Krakatoa (q.v.), between Java and Sumatra, which took place in 1883, after a period of 200 years' quiescence, was an eruption of extremely explosive violence. In 1902 two eruptions occurred in the is. of St. Vincent and Martinique in the W. Indies, the phenomena being practically the same in both cases. 26,000 people in St. Pierre, Martinique, were killed. In the Hawaiian is. the volcanic eruptions are of the quiet type. Mauna Loa is the largest of four volcanic cones in the is. of Hawaii, and is 14,000 ft. above the sea. During an eruption the lava flows out from fissures in the side of the mt. in streams which are sometimes half a mile in width, and flow for 50 m. In Iceland three types of eruptive vents are considered: (1) cones built of ash and lava; (2) cones built of lava alone; (3) chains of craters. The first two correspond to the Vesuvian and Hawaiian types. The third type is common in Iceland. Hekla erupted in 1947, the first time in 102 years. The explosion was preceded by an earthquake; streams of lava flowed to the N.E., and fine dust reached Copenhagen, 1250 m.

distant. This was the twenty-third eruption of the V. since Iceland was discovered. Eruptions which are strictly not from Vs. are those described as fissure eruptions. These are lava flows which cover thousands of square m., and are known in the basin range of N. America (Snake R. plains), in the Deccan plateau of India, and in the basalt plateau of N.W. Europe.

Regarding the occurrence of Vs. it is found that though a few occur isolated, yet as a rule they are met with in extended lines within comparatively short distance from the sea, and are usually situated on important lines of fracture, i.e. generally where the surface of the earth's crust is steepest. The lines of Vs. are generally parallel to the shores of the continents, and they form a complete 'Girdle of Fire' round the Pacific. The Atlantic Chain embraces the Vs. of Iceland, the Azores, and the Canaries, and another line is formed by the Vs. of the Mediterranean. Extinct Vs. also occur in many other regions. The agents concerned in causing volcanic eruptions are super heated waters or their component gases. The water is regarded as contained in the molten magma under extremely high pressure, and the eruptions are caused by the sudden expansion of large volumes of steam, which escape along the lines of weakness. Intimately associated with Vs. are geysers (q.v.). See also AGGLOMERATE, BOMB, LAVA. See A. Hawker, *The Natural History of Igneous Rocks*, 1909; G. W. Tyrell, *Volcanoes*, 1931; and S. N. Coleman, *Volcanoes New and Old*, 1950.

**Vole**, name given to various species of rodents. The water V. or water rat (*Arvicola amphibius*) is about 1 ft. long from nose to tip of tail. Its fur is thick and shining, rich reddish brown above and yellowish grey beneath. Its feet are not webbed, although it takes readily to water. It feeds chiefly on the stalks of sedges and other aquatic plants, and is of service in helping to keep water-courses clear. The field V. occasionally occurs in swarms, causing heavy losses to crops. See also LEMMING; MUSK RAT.

**Volga**, (anc. Rha), longest riv. (2325 m.) and one of the chief waterways of Europe. It lies entirely in Russia, and rises in the Valdai Hills of Tver, eventually reaching the Caspian Sea at Astrakhan by as many as 200 mouths. After the Oka (from the S.) and the Kama (N.), both of which are longer than the Rhine (760 m.), the chief tribs. are the Shesna, Unzha, Vetluga, and Akhtuba. The affluents together are navigable for as many as 20,000 m., whilst the main stream is navigable to within 65 m. of its source. The first commercial ports on the V. are Astrakhan, Stalingrad, Rybinsk, Gorki, and Saratov; whilst Tver, Yaroslavl, Kostroma, Kazan, and Kuibishev are also on its banks. In spite of the fact that it is ice-bound from 90 to 160 days each year, this riv. is the great artery of commerce for the products of N. and central Asia as well as of Russia. Canals have opened up communication with Lenin-

grad, Riga, and Archangel. Its waters abound in fish, especially salmon and sturgeon. About 40 per cent of the fish caught in the waters of the U.S.S.R. are caught in the Lower V. The black caviare from the V. is a monopoly of the Soviet Union. Astrakhan is the U.S.S.R.'s chief centre for the fishing industry. The lands on either side of the V. between Stalingrad and the Caspian Sea, form one of the most important areas of intensive agriculture in the whole of the Soviet Union. See also EASTERN FRONT OR RUSSO-GERMAN CAMPAIGNS IN SECOND WORLD WAR.

**Volga German Republic**, see GERMAN VOLGA REPUBLIC.

**Volga Germans**, see under GERMAN VOLGA REPUBLIC.

**Volhynia**, Region of the Ukrainian S.S.R., between the Polish frontier and Kiev. In the V.-Podolsk Upland lie the iron-mining settlements of the Ukraine, the chief of which is Kivori Rog. The inhab. are mainly Little Russians.

**Volition**, see WILL.

**Volkssturm**, force similar to the Brit. Home Guard, raised by the Gers. as a last line of defence in the winter of 1944-45 when the Allies were closing in on the frontiers of the Reich. The V. consisted of virtually all able-bodied Gers. not in the armed forces, the term 'able-bodied' being very liberally interpreted.

The V. was armed with a variety of weapons, often war booty and often obsolete. As a *levée en masse*, however, the V. was a failure.

**Volos**, seaport of Thessaly, Greece, on the Gulf of V., with a museum of antiquities. It is the seat of a Gk. metropolitan. Pop. 30,000.

**Volodga**: 1. Region of the R.S.F.S.R. It has a short coast-line on Lake Onega, and in its area are the Beloe and Sokol lakes. The country was once heavily forested. 2. Cap. of the above. There is considerable commerce in linseed, flax, oats, and dairy produce. It has flour mills, tanneries, and pottery, cement, and glass works. Pop. 95,200.

**Volsci**, anc. It. people of E. Latium, akin to the Oscans and Umbrians, dwelling on both sides of the Liris down to the Tyrrhenian Sea. They were at war with the Romans. In the fifth and fourth centuries B.C. and often allies of the Aequi, but were subdued (338) and made Rom. citizens by 304.

**Volscian Dialect**, see under LATIN LANGUAGE AND LITERATURE.

**Volstead Act** (U.S.A.), see under PROHIBITION.

**Volsungs**, heroic race prominent in old Germanic and Norse sagas, the founder of which was Volsung, the grandson of Odin.

**Volt**, practical unit of electromotive force (E.M.F.) in electricity, so called after Alessandro Volta (q.v.). In Eng. it was defined by order in council (1894) as having 108 absolute units in the C.G.S. system: and as being that electrical pressure which, when applied to a conductor whose resistance is 1 ohm, will produce a current of 1 ampere. The

voltage of a system simply means the difference of pressure exerted on the system measured in volts.

**Volta, Alessandro, Count** (1745-1827) It. physicist, *b.* at Como, noted for his electrical discoveries. He invented the electrophorus, an electrical condenser (1782), and the hydrogen lamp (1777). His most noted discovery was, however, that of the development of electricity in metallic bodies (see *Philosophical Transactions*, 1793), and repeated experiments leading to the invention of an electrical battery and later of the 'Voltaic' (or Galvanic) pile (see *Philosophical Transactions*, 90, 1800). Collections of his works were pub. in 1816 and 1918-29 and letters (*La Correspondence de Alessandro Volta et M. von Marum*), ed. by J. Buscha in 1904. See lives by Z. Volta, 1875, and C. Volpati, 1927.

**Voltaic Cell**, see CELL, VOLTAIC.

**Voltaire, Jean François Marie Arouet de** (1694-1778), Fr. sceptic, dramatist, and historian, *b.* in Paris, his father being an official in the *Chambre des Comptes*, educated at the Jesuit Collège, Louis le Grand. By the age of eighteen his literary abilities had gained him entrance into the most brilliant intellectual circles. In 1715 he was banished, and on his return in 1717 imprisoned in the Bastille for writing a scurrilous lampoon on the regent. He had already written the tragedy *Œdipe*, and on his release in 1718 it was performed with brilliant success. He now assumed the pseudonym of 'Voltaire,' an anagram of Arouet (le)(jeune). In 1725, he was exiled to England. Here, as the protégé of Bolingbroke, he was welcomed in intellectual circles and became versed in Eng. politics, literature, and philosophy, the latter especially stimulating his scepticism. On his return to Paris (1729) he realised a fortune by speculation. In 1734, threatened with arrest for his *Lettres Anglaises* (pub. without his authority), he retired with his mistress Madame du Châtelet to Cirey, Champagne. By this time he had already produced the *Lettres Philosophiques* (1734), *Histoire de Charles XII.* (1731), and *l'Épître philosophique à Uranie* (1732). At Cirey he wrote the plays *Alzire* (1736); *Mérope* (1743); and *Mahomet* (1741); the poetical satire *La Pucelle* (1738); *Treatise on Metaphysics* (1734); a thesis on Sir Isaac Newton; part of *Siècle de Louis XIV.* (1751); *Les Mœurs et l'Esprit des Nations* (1756); *Zadig* (1748), and other eastern tales. In 1746 he was elected to the Academy. Meanwhile, V. had become the intimate correspondent of Frederick the Great, and in 1750 V. visited Frederick at Berlin. Here he was entertained in great style, his chief occupation being to correct his patron's writings, but a disparity of temperament led to V.'s departure in 1753. The *Siècle de Louis XIV.* was completed about this time. From 1755 onwards, V. spent his time at Ferney, near Geneva, beginning his anti-Christian writings in 1762. Other works of the period include *Candide* (1759, a novel serving as a vehicle for political and social satire), the *Dictionnaire Philoso-*

*phique* (1764), hists. of Peter the Great, of India, and of Louis XV., the *Treatise on Toleration* (1763), and *Irene*, (1778) the last being performed with triumphant success on V.'s return to Paris in 1778.

V.'s contemporary fame rested chiefly upon his verse tragedies, whereas afterwards it is by his stories and histories that his fame has been principally supported. After his visit to England V. showed a new maturity, abandoning his early hedonism and becoming a true 'philosopher' of his age. Hist. he sought to treat scientifically as the story of the human mind and of the advance of civilisation. He strove passionately for justice; in the Calas case thus he devoted three years to establishing the innocence of a Protestant father executed in 1762 on the charge of murdering his son to prevent his joining the Catholic church. He was a sworn enemy of theocracy and the coercive power of the church, and in the *Essay on Toleration* (1763) and the *Philosophic Dictionary* (1764), books the influence of which was immense, he took up the work with less disguise of irony than before. He was always a deist, and always believed in a social morality which he considered common to all men in all ages. Later he developed a theory of a conscience implanted by God, and finally came to a belief in a God who is goodness itself, standing in some direct relationship to man. To the gift of a unique artistry in words V. added an incomparable industry and daring, and a life of service to mankind in the ideals of tolerance, justice, and freedom. He was one of the most voluminous letter writers who ever lived; some 12,000 to about 700 correspondents are extant and afford a wealth of information about the eighteenth century. There are eds. of his works by P. A. Caron de Beaumarchais (70 vols., 1785-89); M. Beuchot (72 vols., 1829-40); and Garnier-trères (52 vols., 1883, 1877-83).

See lives and studies by Sir. E. B. Hamley, 1877; J. Parton, 1881; J. Morley, 1872, 1886; F. Espinasse, 1892; G. Lanson, 1906-1912; A. Aldington, 1925; C. E. Vulliamy, 1930; A. Mauros, 1932, 1948; A. Noyes, 1936.

See also J. C. Collins, *Voltaire in England*, 1908; A. Bellesort, *Essai sur Voltaire*, 1925; E. Henriot, *Voltaire et Frédéric II.*, 1927; M. M. H. Barr, *A Century of Voltaire Study: A Biography*, 1928.

*tuellés de la révolution française*, 1933; and M. Leroy, *Histoire des idées sociales en France*, 1946.

**Volterra, Vito** (1860-1940), It. mathematician and physicist, *b.* at Ancona. He was prof. of mechanics at Pisa and Turin in 1883, and held the chair of physics at Rome from 1900. His work on the theories of electricity led him to the study of differential equations, from which he arrived at the basis of functional analysis. This he adapted to the form of integral equations (Volterran).

**Volterra**, episcopal see of Tuscany, in the prov. of Pisa, Italy. Many valuable



Rom. and Etruscan remains are in its museum. The chief trade is alabaster. It suffered damage during the Second World War. Pop. 18,200.

**Volt Meter**, instrument used for measuring electro motive force in volts. The types of volt meter in use are the moving coil type (D.C.), moving iron type (A.C./D.C.), thermal type (A.C./D.C.), dynamometer type (A.C./D.C.), electro static type (A.C./D.C.), induction type (A.C.), and rectifier type (A.C.). The instrument used for the measurement of volts and amperes is basically the same and they differ only in the fact that a V. M. has a coil with a large number of turns and the ammeter has a coil with a relatively few turns; the reason for this is because the V. M. is connected across the mains and has to withstand the full pressure of the circuit but the ammeter is connected in series and therefore only possesses a low resistance. *See also under ELECTRIC METERS.*

**Volturno**, riv. of Italy. Rising in the Apennines it flows through Campania to the Gulf of Gaeta. The Calore is its main trib. The V. is 105 m. long. In Oct. 1860 it was the scene of Garibaldi's defeat of the Neapolitan army. *See also under ITALIAN FRONT, SECOND WORLD WAR CAMPAIGNS ON.*

**Volume and Capacity, Measures of**, *see under WEIGHTS AND MEASURES.*

**Volumenometer**, *see SPECIFIC GRAVITY.*

**Volumetric Analysis**, *see ANALYSIS, CHEMICAL.*

**Voluntary Aid Detachments**, *see RED CROSS, THE.*

**Volunteers**. V in Brit. armies were usually individuals serving at their own charges, sometimes with a view to acquiring military experience before taking a commission. When in the second half of the eighteenth century the militia (*q.v.*) was embodied for long periods at a time, many who would have been exempt from the military ballot or could have become so on payment of a fine chose alternately to serve as V. and formed volunteer companies within the co. militia regiments. The first Volunteer Act of 1782 provided that if such companies or corps served outside their own in. or co. the rank and file would be paid, lodged, and rationed as regulars. Similar Acts in 1794, 1798, and 1802 confirmed this arrangement and also bound V. and yeomanry to act in support of the civil power in case of riots. The formation of such units had the effect of drawing off the more dependable elements from the militia, and legislation from 1804 onward was designed to discourage the enlistment of V. as such and to force them by economic and other means into the local militia. In some cases whole volunteer battalions transferred bodily into the militia.

By 1816 all volunteer units had been disbanded and Sir Robert Peel's new police force, once it was formed, did away with the need for an armed body to enforce the law. But between 1848 and 1859 distrust of France as the dominant continental power and the duke of Welling-

ton's warnings about the weakness of the regular forces gave rise to a V. movement among the more prosperous middle class, who formed numerous 'rifle volunteer' corps, most of which were grudgingly recognised by the gov. From 1859 to 1863 the War Office paid more attention to the movement, and the various corps were formed into battalions for administrative purposes. Some corps dating from this period still survive as Territorial units.



A SCOTTISH VOLUNTEER (c. 1887)

John Armstrong, a member of the Highland Company, 4th Lanarkshire Rifle Volunteers.

It is difficult to assess the military value of this force because none of the corps as such, was ever in action, but in the S. African war of 1899 some provided companies which were attached to line regiments and a new City of London Imperial Volunteer regiment was formed. Large numbers of men from Volunteer Corps also joined the City Imperial Yeomanry, but the force remained too heterogeneous and lacked a central administration. In 1908 it was merged, with the Yeomanry, in the Territorial Force, later the Territorial Army (*q.v.*). *See H. Baker, The Territorial Force, 1909.*

**Volunteers, South Irish**, *see under IRISH REPUBLICAN ARMY.*

**Volunteer State**, *see TENNESSEE.*

**Volvox**, genus of small flagellate protozoa, common in ponds, and resembling green algae.

**Vomiting**, reflex act by which the contents of the stomach are violently ejected through the cardiac orifice, up through the oesophagus, and out of the mouth. It is caused by the presence of irritating substances in the stomach, and under such circumstances is a protective effort of the organism. It may, however, be produced by a variety of different causes: by certain drugs; by diseases such as peritonitis, gastric ulcer, constipation, kidney disease, liver disease, consumption, etc.; by certain visual, olfactory, or other sensations; or by reflex nervous stimuli, as in the 'morning sickness' of pregnancy, which originates in the pelvic region. The treatment of V. consists of: (1) removing the cause, if possible, (2) administration of drugs which exert a sedative action on the stomach and reduce the irritability of the 'vomiting centre' in the medulla of the brain.

**Voodoo**, religion practised by the Negro pop. of some W. Indian is. especially Haiti. It is an active faith based on the worship of the sun, water, and other natural forces, and its rites are derived from many sources, including the drinking of blood, eating of flesh, and black magic. See J. J. Williams, *Voodons and Obeahs: places and phases of West Indian Witchcraft*, 1933; and Z. N. Hurston, *Voodoo Gods*, 1939.

**Voortrekkers**, name given to the groups comprising the Great Trek or Boer migration from Cape Colony between 1836 and 1848, during which time one in ten of the Colony's pop. took part in an exodus by way of an organised attempt to seek a country away from the Brit. in which they might develop along their own lines.

In 1836 the trek to the N. began. At first somewhat spasmodic, the movement of the V. soon became a great outward rush. The Great Trek was in fact a piecemeal long drawn-out movement. All the V. took, roughly, the same direction, N.E., and N. from the Cape Colony to what is now Rhodesia, but the trek parties varied in size and each trek had its own leader, only joining in face of danger. The trekkers moved across the drifts of the middle Orange R., and over the open country on each side of the Vaal, a dispersion which was made less hazardous towards the end of 1837 after the defeat of the Matabele of chieftain Moselekatshe (q.v.) by V. under Pieter Uys and Hendrik Potgieter. By the close of 1837 the Matabele were streaming across the Limpopo and the high veld had fallen to the V. by right of conquest. To complete their independence the Boer Republics needed access to the sea, and Retief, leader of the greatest body of V., crossing the Drakensberg Mts., sought land from the Zulu chief Dingaan. He agreed to cede land to the Boers and invited Retief to a feast where he massacred Retief and his companions. The main body of Boers, warned of what had happened, successfully defended themselves. Subsequently Andries Pretorius, greatest of the Boer leaders, appeared on the scene with a force of 430 farmers and

took the offensive against the Zulu army, estimated at more than 30,000, and on Dec. 16, 1838, gained a decisive victory. In 1840 the Boers proclaimed Natal a republic. In 1836 the only European settlement S. of the Orange riv. had been the Cape Colony; by 1848 Natal, the Orange Free State and the Transvaal were estab. as under European control and open to W. civilisation, a notable achievement which in the main was the work of the V.

The prin. memorials to the V. are the V. monument on Voortrekkerhoogte near Pretoria which was dedicated in 1949, and the V. museum at Pietermaritzburg.

See G. McC. Theal, *History of South Africa since 1795*, 1908; C. F. Richardson, son, *South Africa from the Great Trek to the Union*, 1909; C. Fuller, *Louis Trichard's Trek across the Drakensberg*, 1927; E. A. Walker, *The Great Trek*, 1934; M. Nathan, *The Voortrekkers of South Africa*, 1937; A. F. Hattersley, *Portrait of a Colony: the Story of Natal*, 1940.

**Vorarlberg**, westernmost prov. of Austria, beyond the Arlberg Pass. V. is bounded N. by Bavaria, W. by the Rhine, Liechtenstein, and St. Gall, S. by Grisons, E. by Tyrol. The area is mountainous; cattle and goats are reared. Cap., Bregenz. Area 1004 sq. m. Pop. 189,900.

**Voronezh**: 1. Region of the R.S.F.S.R. It is watered by the Don, and has uplands in the W. and E. of the Don, as well as low, level, and sometimes sandy stretches. There is no great extent of forests, and the soil in general is fertile. Besides all kinds of cereals, sunflower, tobacco, am- seed, and beetroot are grown and exported, and there are rich pastures for horse, cattle, and sheep breeding. Area 2929 sq. m. Pop. 3,551,000. 2. Cap. of the above, on the V. riv. It is an attractive city, depending for its flourishing commerce on the Don, which brings down wood, tallow, hides, and flax, besides cereals. It is a silk-growing centre. Agric. and textile machinery, aircraft, and engineering products are made, and synthetic rubber produced from potatoes.

In the Second World War the Ger. thrust in June-July 1942 from Kursk to V. was thwarted by the successful Russian resistance at V. See further under EASTERN FRONT or RUSSO-GERMAN CAMPAIGNS IN SECOND WORLD WAR.

**Voronoff, Serge** (b. 1866), Russian surgeon, b. at Voronezh, and educated in Paris, where, before the First World War, he was chief surgeon in the Russian Hospital. In 1917 he became chief surgeon in the Military Hospital. Afterwards director of the biological laboratory at the Ecole des Hautes Etudes, later he became director of experimental surgery of the Station Physiologique, Collège de France. V. became celebrated for his experiments toward restoration of aged persons to youthful vigour by transfusion of reproductive glands (testes) from apes.

**Voroshilov, Kliment Yefremovich** (b. 1881), Russian soldier and politician, b. at Verkhneye, was a worker at the Lugansk locomotive works and joined the Russian revolutionary movement. V. was a mem-

ber of the Central Committee of the Communist Party from 1921, and in 1926, he became a member of the Politburo. V. was War Commissar from 1925 to 1940, being responsible for the development and mechanisation of the Red Army, besides reorganising the general staff. In Jan. 1943 he directed the operations that led to the lifting of the siege of Leningrad.

**Voroshilovgrad**, region of the Ukrainian S.S.R. Wheat, maize, and cattle are produced. Area 1003 sq. m. Pop. 1,096,000. 2. Formerly **Lugansk**, cap. of the above, 143 m. E. of Dnepropetrovsk, one of the great industrial centres of the Donbas. In the neighbourhood are anthracite coal mines; the tn. has large iron and machinery works, and is the oldest iron and steel centre in S. Russia. It was here that the first experiments made in Russia in the smelting of iron with coke were made in 1797. It is the centre for the building of the latest types of Russian freight and passenger locomotives. V. has a large trade in grain, cattle, linseed, wine, and corn. Pop. 213,000.

**Voroshilovsk**, formerly **Stavropol**, tn. on the Stavropol Ter. of the R.S.F.S.R. on the N. slopes of the Caucasus. It is a railway junction, has oil refineries, and manufs. agric. machinery. Pop. 85,100.

**Vortex**, term used in hydrodynamics for a motion in a fluid in which the individual particles are conceived as having a circular or rotatory motion. In hydrodynamics a distinction is drawn between such a motion and one in which there is no rotation of the individual particles, a distinction first pointed out by Stokes. Larrange then stated his great fundamental theory of these two types of motion in a non-viscous or perfect fluid. He stated that irrotational motion always remains as irrotational motion, and rotational or vortex motion always remains as vortex motion. Thus it is impossible to start or destroy vortex motion in such a liquid. Vortex motion is represented by a straight line vector perpendicular to the plane of rotation, and of length proportional to the vorticity. It can be shown that such a line or filament cannot start or end in the interior of the fluid, and that a vortex always consists of the same elements of liquid. Kelvin adopted this idea in his vortex theory of matter, conceiving matter as vortices in motion in the all-pervading ether.

**Vorticism**, see under LEWIS, WYNDHAM.

**Vortigern**, or **Wyrtegeorn**, tribal chieftain in Wales, invited the Saxon leaders Hengist and Horsa (according to the *Historia Brittonum*) to land and settle in Kent. Thus he employed the invaders to assist in the defence of post-Rom. Britain against its internal and external enemies. The invading colonists later turned upon V. and the Brit., and overran the land.

**Vosges**, frontier dept. in E. France, shut in eastward by the V. Mts., the highest Fr. peak being Hohneck (4482 ft.). The Moselle and Meuse have the largest drainage areas. Coal, iron, copper, and lead are found, and there are mineral

springs. Oats, wheat, and the vine are cultivated, and cheese-making and cattle-grazing are important. Large forest tracts account for the wood-working industries, but textile goods are the chief manuf. The cap. is Epinal. It has three arrons.: Epinal, Ste. Die, and Neufchâteau. Area 2303 sq. m. Pop. 342,300.

**Vosges Mountains** (Lat. *Vogesus*), range of mts. along the W. bank of the Rhine, closely resembling in many respects the Black Forest along the E. They stretch for 150 m. from Basel to Mainz, through Lorraine and Alsace. The Ballon de Guebwiller is the culminating point (4680 ft.). Silver, copper, coal, lead, and rock salt are mined, and vines grown on the lower slopes.

**Votiaks**, numbering c. 275,000, a people speaking a Finno-Ugrian language (see under URAL-ALTAIC LINGUISTIC FAMILY), and living in the basin of the lt. Viatka, a tributary of R. Kama, itself a tributary of R. Volga. The V. constitute the Autonomous Votyak Region, which is part of the R.S.F.S.R. (see under RUSSIA).

**Vouet, Simon** (1590-1619), Fr. historical painter, b. in Paris. V. accompanied the Fr. ambas. to Constantinople (1611), and went to Italy (1612), studying the works of Paul Veronese at Venice and of Caravaggio and Guido Reni at Rome. Louis XIII. recalled him to France (1627) as his prin. painter, and gave him work in the Luxembourg, Louvre, and St. Germain palaces. His 'Virgin and Child' is in the Ashmolean Museum, Oxford.

**Vowels**, see ALPHABET, PHONETICS.

**Vratza** (**Vratza**): 1. Dist. of Bulgaria, in the N.E., with Yugoslavia to the W. and Rumania to the N. Area 4298 sq. m. Pop. 771,500. 2. Cap. of the above, on the N. slope of the W. Balkans, 40 m. from Sofia, on the railway from Sofia to Vidia. It produces wine, silk, gold and silver filigree, jewellery, and leather. Pop. 16,000.

**Vreclahi**, see HOHENELBE.

**Vriendt, Cornelis, and Frans de**, see FLORIS.

**Vries, Hugo de**, see DE VRIES.

**Vriesland**, see FRISLAND.

**Vryburg**, cap. of V. dist., Brit. Bechuanaland (E.), S. Africa, 124 m. from Kimberley. Founded 1882, it is a Wesleyan Missionary Society station. It is a livestock centre and has a butter factory and a soap works. V. is the starting point of the Rhodesian railway system which extends through the Bechuanaland Protectorate and S. and N. Rhodesia to the Belgian Congo. Pop. European, 2000. Native, 2300. Asiatic, 200. Coloured, 500.

**Vrynwy**, artificial lake in Montgomeryshire, Wales. Made in 1890 to 1905 in order to give a water supply to Liverpool. The name is that of a trib. of the Severn used to fill the lake, which is 5 m. in length. It is 68 m. from Liverpool.

**Vryheid** (old Dutch, 'freedom'), tn. of N. Natal, S.E. Africa, 133 m. from Pietermaritzburg. It is the cap. of V. dist., rich in coal (at Hlobane), copper, gold, and other minerals. Once part of Zululand, it was ceded to the Boers under

Meyer, proclaimed an independent 'New Republic' (1884), incorporated with the Transvaal (188), and annexed to Natal. Pop. European, 3600, Native, 3000.

**Vulcan**, hypothetical planet. In 1859 Leverrier suggested that perturbations of Mercury's orbit unaccounted for were caused by an unknown planet revolving nearer the sun, but no discovery has resulted from any observations, and the existence of V. is discredited. Einstein's theory has explained the discrepancy in the motion of the perihelion of Mercury's orbit.

**Vulcan**, Rom. god of fire, identified with the Gk. god Hephaestus (*q.v.*)

**Vulcanisation**, see under RUBBER.

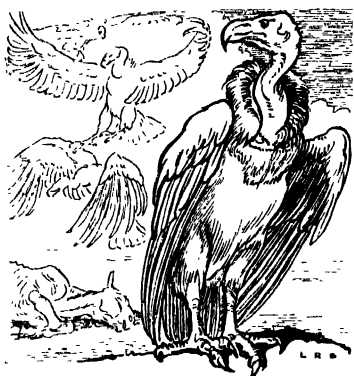
**Vulcano**, see LIPARI ISLANDS.

**Vulgate** (Lat. *Vulgata*, commonly used), name sometimes given to the Septuagint (*q.v.*), but principally to the Lat. version of the Bible prepared by St. Jerome in the latter part of the fourth century. He revised the N.T. at the invitation of Pope Damasus, and this part of the V. was little more than a revision of the existing text; the O.T. version was an independent trans. from the Hebrew into Lat. It was declared authentic by the Council of Trent for use in the Rom. Church. In 1907 Pope Pius X. appointed a commission to prepare a new official version. Its work is still far from complete (1950).

St. Jerome's trans. became corrupted, and various recensions became necessary, one by Alcuin in the early ninth century, another by Lanfranc (1089). The invention of printing led to the issue about 1456 of the Mazarin Bible printed at Mainz by Gutenberg and Fust. A revision by Toletus at the instance of Pope Clement III. was issued in 1592 and is the authorised ed. in the Rom. Church. Wycliffe's version of the Bible was made from the V.; and thus that version has affected the A.V. as it has those in the languages of Europe. The Eng. trans. of the V. known as the Douai was pub. in 1582 (N.T.), and 1609 (O.T.), with subsequent revisions in 1749-50 and 1881-5. A completely new trans. has been brought out by Monsignor R. A. Knox of the N.T. in 1943, and of the O.T. in 1948-49.

**Vulpera-Tarasp**, see TARASP.

**Vulture**, bird with a strong hooked beak, and repulsive in appearance and habits, but of considerable value on account of its food being mainly composed of carrion, which it discovers by its abnormally keen senses of sight and smell. Vs. cannot, like eagles, carry food with their feet and claws, but feed their young by regurgitating from the crop, as pigeons do. They



VULTURE

are classified in two families, the Vulturidae and the Cathartidae. The former include the griffon V. (*Gyps fulvus*) which occasionally roaches Britain, the black V. (*Vulture monachus*), and the Egyptian V. (*Neophron pernopterus*). Among the Cathartidae are some birds of great size and powerful flight such as the condor (*Sarcophagus gryphus*), the black V. (*Catharista atratus*), and the Turkey buzzards (*Ictinogryphus*).

**Vüpurí**, see VILPURI.

**Vyatka**, see KIROV

# W

**W**, twenty-third letter of the Eng. alphabet. As a letter it appeared only in the eleventh century. Its phonetic value in Eng. is that of a 'consonantal *u*,' but its name 'double *u*' comes from the fact that when it was created as a separate sign, it was formed as a differentiation of *V* (which, at the time, had not only the value of *v* but also of *u*): *W* The N.-Sonotic *waw* and, its descendant, the Gk. *digamma* (see under *F*) probably had a similar phonetic value to that of the Eng. *w*. According to some scholars also the Lat. *V*, representing the consonantal *v* and the vocalic *u* (see under *V*), was pronounced like our modern *w*. The A. S. alphabet represented the sound *w* by the letter *wynn* (*þ*). The Gers. have no sound like the Eng. *w* and employ the letter *w* for the sound *v*. Nor have the Slavonic languages a *w*-sound: in consequence, the Czech alphabet has no *w*, and the Polish alphabet has a *w*, which is pronounced like the Eng. *v*. In Eng., the letter *w* is capable of performing the functions both of consonant (as in *war*, *with*, *wine*) and vowel (as in *law* or *few*). In Welsh names it is generally a vowel (*Beltius-y-Coed* or *Brach-y-pwll*). The Fr. use *ou* as a substitute, or *Gu* for proper names (Guillaume for William). The Sp. use mostly *hu* (Huano, Huéva), but sometimes *gu* (Guatemala, Guadiana). In chemistry, *W* is the symbol for one atom of tungsten (wolfram).

**Waad**, see **VAUD**.

**Waal**, riv. of the Netherlands. The Rhine divides, 9 m. E. of Nijmegen, into the Neder Rijn and the *W.*, the latter becoming the Merwede at its confluence with the Meuse 2 m. E. of Gorinchem. Nijmegen, Tiel, and Zalt-Bommel are the prin. tns. on the *W.*

**Wabash**, trib. of the Ohio R. rising in Ohio, and flowing through Indiana, eventually forming the boundary between Indiana and Illinois. It is connected with Lake Erie by the *W.* and Erie Canal. Length about 550 m.

**Wace**, Robert, (c. 1115-c. 1183). Anglo-Norman poet, *b.* in Jersey. His most important works are his historical poems, the *Roman de Brut* and the *Roman de Rou*.

**'Wacht am Rhein, Die'** ('The Watch on the Rhine'), Ger. patriotic song, written when France threatened the l. b. of the Rhine (1840). The words were by Max Schneckenburger (1819-49), and in 1854 were set to music by Carl Wilhelm (1815-75).

**Waco** (so called from the Waco or Hueco Indians), cap. of McLennan co., Texas, U.S.A., on the Brazos, 186 m. by rail N.W. of Houston. It is a univ. city and an important cotton market. Pop. 56,000.

**Wadal**, dist. of Fr. Equatorial Africa, the N.E. part of Chad Ter., accepted the

Fr. Protectorate in 1903; since 1909 it has been part of Fr. Equatorial Africa. *W.* is bounded on the N.E. by Darfur, and on the N. is the Sahara Desert. The climate is hot and dry. The cap. is Abeshr, which is the head of caravan routes connecting it to Benghazi, on the coast of Tripoli and Brit. W. Africa. Chief minerals are copper, zinc, and lead. Cattle, camels, and ostriches are reared. Area 170,000 sq. m. Pop. about 1,000,000.

**Waddell**, Helen (b. 1889), Brit. scholar and translator, *b.* in Tokio. She was educated at Victoria College and Queen's Univ., Belfast. Her *Wandering Scholars* (1927) is an outstanding contribution to medieval studies.

**Wade**, George Edward, see **ROBEY**, **GEORGE**.

**Wadebridge**, mkt. tn. of N. Cornwall, England, 6 m. from the coast, and at the head of the Camel estuary. A bridge of fifteen arches dating from 1485 spans the riv. at *W.* *W.* is an agric. centre, and has a foundry. Pop. 2700.

**Wadham College**, Oxford, founded in 1612 by Nicholas Wadham of Merfield, in Somersetshire, for a warden, fifteen fellows, fifteen scholars, two chaplains, and two clerks. It was built upon the site of an anc. house of the Augustinian Friars, and in this college the Royal Society had its origin, and held its sittings from 1652-59 in the great room over the gateway.

**Wadi**, or **Wady**, Arabic word signifying a riv., a riv.-course, ravine, or valley. True *Ws.* are riv.-courses dry except for a brief period in the rainy season; it is also of frequent occurrence in the names of places, e.g., *Wadi Musa*, in Arabia. In Spain, *wad* has been transformed into *quad*, e.g. *Wadi-l-abyadh* has become *Guadalquivir*.

**Wading-bird**, see **COURLAN**.

**Wadi Halfa** (and **Halfa Province**), tn. in Halfa Prov., Anglo-Egyptian Sudan. It is the frontier tn. of the N. Provs. and the N. gateway of the Sudan. It includes a Brit. camp, a civil cantonment, and a native tn. on the Nile, just within the frontier of the Anglo-Egyptian Sudan. The Sudan Railway across the Nubian desert from *W. H.* to Abu Hamad, was begun in 1897; it now extends, via Atbara to El Obeid. Halfa prov. extends from the Egyptian frontier to the third cataract. The people are Nubians and still retain their own language, although the traders understand Arabic. The inhab. of Halfa depend almost entirely on the Nile for a livelihood. For a large part of its course through the N. part of Berber and most of Halfa the Nile is shut in by barren rocky hills, beyond which there is nothing but desert. Rainfall is scarcely measurable. See

Sir H. Macmichael, *The Anglo-Egyptian Sudan*, 1934, and J. A. de C. Hamilton (ed.), *The Anglo-Egyptian Sudan from within*, 1935.

**Wadsworth, Edward Alexander** (1889-1949), Brit. artist, b. at Cleckheaton, and educated at Fettes and the Slade. He served in the R.N.V.R. during the First World War. He became A.R.A. in 1943. He was primarily a painter of scenes and objects, and not a figure-painter; his paintings of industrial scenes and nautical subjects are his most outstanding. The latter group, which includes *Port de Mer*, possess a mellowness which is lacking in his industrial scenes. These are strikingly hard and stark.

**Wager of Battle**, see TRIAL BY COMBAT.

**Wager of Law**, name by which the mode of proof by compurgation continued to be employed occasionally in actions for debt until finally abolished in 1833. Compurgation was the alternative to trial by ordeal. (See also COMPURGATOR).

**Wages**, price of labour, or that part of wealth (*q.v.*) which is given in exchange for labour. The ultimate source of W. as of profits (*q.v.*) is the value of that which capital and labour jointly produce, but in practice W. are paid in the first instance out of capital. That part of wealth which is expended in W. is commonly called by economists the wages-fund, an expression which is now generally understood to mean no more than that in every industry the wages-capital must be in a certain ratio to the rest of the capital; but, as formulated by Mill, the wages-fund theory regarded general W. as being determined by the 'ratio of capital to pop.'; a theory which has caused much controversy. Competition between employers tends to raise W., between labourers, to lower them.

In this respect, however, it is necessary to take into account the modification of the extreme results of unchecked competition effected by (1) trade unions (*q.v.*), and (2) Minimum Wage Acts. Under the Coal Mines (Minimum Wage) Act, 1912, dist. boards were set up to settle the rate of W. in different coal areas, and the effect generally of such Acts as this, and of the Minimum Wages Regulations under the Trade Boards Act, 1909 and 1913, was that many workmen or labourers obtained increased rates. The outbreak of the First World War led to the postponement of further legislation to regularise W., and it was not until 1918 that the Trade Boards (*q.v.*) Acts of 1909 and 1913 were extended to other trades, securing a minimum W. to many millions of workers who up till then had been outside the scope of the protection afforded by the Acts. But the fixing of a mere minimum W. in depressed trades offered no solution to the W. problem as affected by the high cost of living after 1918, and in that year the Wages (Temporary Regulation) Act became law. It had the effect of fixing as minima W. in force at the time of its passing with the provision for adjustment by an Interim Court of Arbitration. The Act was passed for six months only, but it was

renewed in 1919, and by the Industrial Courts Act of the same year certain of its provisions were still further extended.

Since then state legislation has provided a permanent safeguard against the exploiting of workers in the trades concerned by the further extension of the facilities of the Trade Boards Acts.

In 1922 a gov. committee was appointed to inquire into the working and effects of the Trade Boards Acts. The report was issued in the same year and is a valuable contribution to the literature of labour questions.

**Wage fixing systems.**—As among different employments the causes that produce different rates of W. are stated by Adam Smith to be (1) the agreeableness or otherwise of the nature of the employment; (2) the difficulty or otherwise, and the expense or cheapness involved in apprenticeship, (3) the constancy of employment; (4) the degree of trust necessarily reposed in the workman, and (5) the chances of success in the given trade. There are various methods of fixing W., the variety being due to a corresponding variety in the demands and character of the employment. Broadly speaking the workers' output will be larger the more nearly the method of payment is adjusted to individual results. In this connection a system of piece W. (see PIECE-WORK) is a common form of remuneration. Under this plan workmen, especially where machinery is used, are paid exactly in proportion to output. Thus the better a man works the more certain he is of regular employment and the greater will be his earning capacity. The system has been for some time practised in coalmining, textile industries, and boot and shoe trades, where conditions make such a system satisfactory, but in such industries as engineering, woodworking, and building a time W. system has been found to be more effective, since the different kinds of machinery and material, besides varying quality of work, make a flat rate of piece W. difficult if not impossible to fix. Such time W. are usually paid by the hour. Another method of wage-fixing is known as task W., and is being adopted where practicable under modern factory economy. Experiments are made to determine what output a first-class workman can produce in a given time. The output thus defined is called a standard task and the W. system is adjusted to encourage the worker to maintain the level of efficiency set by it. The plan is in operation in many of the mass-production works of the U.S.A. The success of the plan depends upon the scrupulousness of the employer, since there is a danger of exploitation, and the strong position of trade unionism in this country appears at present to make it improbable that the system will be widely adopted. (On the influence of protection on wages, see under PROTECTION and TARIFF; and on the connection between W. and prices, see under PRICE.)

**Wage rates in relation to the cost of living.**—In 1908-09 W. were depressed, but thereafter began to rise, the most marked

increase being in 1912; which upward tendency was steadily maintained until the outbreak of the First World War. The increased cost of living caused by the War resulted in a rapid rise in W. though they did not keep pace with the cost of living, and wage rates rose to their peak during the industrial boom of 1920, when a reaction took place. After 1924 money wage rates, according to the Ministry of Labour statistics, remained practically unchanged at 170 to 175 per cent of the pre-War level, and Prof. Bowley's index of earnings showed a fall of about 1 per cent from 1924 to 1930. During the 1931 world-wide financial crisis wage rates fell considerably and the continuance of the trade depression resulted in a further reduction.

An upward movement in the general level of wage rates occurred during the Second World War and became still more marked in the first half of 1946, but in the ensuing six months the position was virtually stable. At the end of 1946, the average level of full-time weekly rates of W. in all the industries for which information was available was about sixty-five per cent higher than at the beginning of the war. In many industries the length of the normal week was reduced during 1946 without any corresponding reduction in weekly rates of W. It is estimated that the increase in hourly rates of W. was about 10 per cent making a total increase, since September, 1939, of 68 to 69 per cent. During 1946 rates of W. were increased in most industries, but in the coal-mining industry there were no general changes in the rates estab. under the four-years agreement made in April 1944. The cost of living continued to rise and in a statement on the economic considerations affecting relations between employers and workers (Cmd. 7018) the gov. stated that it was essential that costs and prices should be held steady and if possible reduced, and therefore that while they adhered to their long-term objective of raising the standard of living, any further increase in wages and profits must be accompanied by a corresponding increase in production. In the second half of 1947 there were, however, further increases in the wage rates in some of the major industries and the average level of full-time weekly rates in all industries was then about 84 to 85 per cent higher than at the outbreak of the war.

In a statement on personal incomes, costs and prices (Cmd. 7321) in the House of Commons (4 Feb. 1948) the Prime Minister pointed out that the costs of production depended to a considerable extent on the amount which industry had to pay in profits, salaries and wages; the gov. was admittedly faced with the development of a dangerous inflationary situation and it was essential that there should be no further general increase in the level of personal incomes without a corresponding increase in the volume of production. The statement added that it did not follow that it would be right to stabilise all incomes as they then stood. There might be, however, cases in which

increases in W. or salaries would be justified from a national point of view. The policy of wage restraint adopted in 1948 by the T.U.C. was re-affirmed in Sept. (1949); but the gov's devaluation policy caused the whole problem to be reconsidered. In the result, however, the T.U.C. in Nov. recommended the unions to adopt a policy of wage stabilisation much stricter than that which had been in operation since Feb. 1948. It was recommended that wage claims and sliding scale arrangements should be reconsidered with a view to holding wages rates stable at least until Jan. 1, 1951, so long as the interim index of retail prices (then 112) remained between 118 and 106. In Sept. 1950 the ann. congress of the T.U.C. rejected the policy of wage-restraint.

*Adjustment of Wages by cost-of-living Sliding Scales.*—In a number of industries (including mining, glass, iron, and steel, textile, clothing, food, drink, and tobacco, woodworking, and building) collective agreements between organisations of employers and workpeople are in operation providing for the automatic adjustment of wage rates, on a pre-arranged basis, in accordance with the changes in the average level of working-class cost of living. This method of regulating wages, first introduced in certain industries towards the end of the First World War, was gradually extended to a number of other industries and services until the total number of workpeople covered by such arrangements had risen, by the year 1922, to about three million. In some industries and services these arrangements were subsequently suspended or abandoned, and by 1939 the number of people covered had fallen to about one and a half million. During the Second World War there was a further extension of such agreements to some other important industries, including coal-mining, pig-iron manuf., iron and steel manuf., cotton spinning, and weaving, and although in other industries sliding scales which were in operation at the beginning of the war were suspended or abandoned, the number of people covered had risen by June 1944 to about two and a half million. After the war the scales in some important industries (cotton, wool, textile bleaching, etc.) were abandoned and comparatively few new scales were introduced; but by the end of 1946 the number of employees whose wage rates were still subject to periodical adjustments under arrangements of this kind was nearly two and a half million, or about the same as in mid-1944. In considering the influence of these scales on the general course of wage rates, it should be pointed out that, both during and after the war, increases in wage rates in the industries in which these arrangements were in operation, had not been restricted to those taking effect under the cost of living sliding scale agreements, most of the two and half million workers concerned having received additional increases in wage rates, or war bonuses, either by direct agreement between the employers' and workers' organisations

or by arbitrators' awards (see **WAGES COUNCILS**). In some of the industries the terms of the sliding scale agreements have been altered so as to provide for an immediate increase, additional to the amount warranted by movements in the cost of living index figure (see **STANDARD OF LIVING**).

**Guaranteed annual wage.**—The International Labour Conference at San Francisco in 1948 adopted a resolution on the desirability of extending the application of the principle of the guaranteed wage to wage earners who were liable to be laid off work temporarily. In Great Britain the principle of continuity of employment over a period has received little attention from the trade union movement, but the 'annual wage' has in recent years become a major objective of Amer. labour. The term, as included by the Amers. in the more general expression 'a guaranteed wage,' which they use to mean a minimum guarantee over a period, not merely for a week, as in Great Britain. Before the Second World War the flour milling industry and a few large concerns like Lever Brothers and some of the cocoa firms introduced schemes assuring their workers continuity of wages or employment, for a quarter of a year or longer, by supplementing unemployment benefit. In post-war conditions of full employment and labour shortage it was considered undesirable for the gov. to allow unemployment benefit to be used for this purpose and changes under the new National Insurance Act forced those concerned to consider what new arrangements could be made. A guaranteed wage plan, as defined in the Latimer report, presented to the president of the United States in 1947, is a plan under which an employer guarantees to all or a defined unit or group of his employees a wage or employment for at least three months. In the case of an ann. wage the guarantee is for 12 months. The Latimer report favours the principle of co-ordinating guarantees with unemployment insurance, as was done by the Brit. concerns above mentioned, but it has not hitherto been legally possible in the U.S.A.

See B. G. de Montgomery, *British and Continental Labour Policy*, 1922; E. Dane, *Wages and Labour Costs*, 1927; H. Clay, *Problem of Industrial Relations*, 1929; A. C. Pigou, *Economics of Welfare*, 1929; *Statistical Abstract of British Empire*, 1931; *Report of Committee on Finance and Industry*, 1931; R. Dickinson, *Wages and Wealth*, 1931; P. H. Douglas, *Theory of Wages*, 1934; N. T. Dunlop, *Wages Determination under Trade Unions*, 1944; J. K. Louden, *Wages Incentive*, 1945; M. Dobb, *Wages*, 1946; M. Heinemann, *Wages Front*, 1947; T. E. M. McKitterick, *Wages Policy*, 1949;

**Wages Councils**, statutory bodies set up under the Wages Councils Act, 1945. By the terms of the Act the minister of labour is empowered to establish a council in any industry in which he considers adequate wage negotiating machinery is lacking or when advised by a commission of enquiry that the existing machinery

is insufficient. The function of the councils, like that of the trade boards which they superseded, is to fix minimum rates of pay for the industry concerned, and such rates when approved by the minister are enforceable at law. Councils may also make recommendations to the minister on conditions of work and recruitment.

**Wagga Wagga**, city of New S. Wales, Australia, on the Murrumbidgee R., approximately midway between Sydney and Melbourne, seat of a Rom Catholic bishopric. It is the centre of the rich agric. and pastoral Riverina region. It has the largest prov. stock market in the State. Pop. 14,000.



**Wagner, (Wilhelm) Richard** (1813-83), Ger. composer, dramatist, and essayist, b. at Leipzig. He studied composition under Weinlig, cantor at the Thomasschule. In 1831 he became conductor of the opera at Magdeburg. By then he had already composed two operas, *Die Feen* (the Fairies) and *Das Liebesverbot* (Love's Interdict). In 1836 he married Minna Planer, an actress at Königsberg, where he had gone in search of employment. From Königsberg he went to Riga where he was made musical director at the new theatre. In 1839 he went to Paris with his unfinished opera *Rienzi*, a remarkable achievement for a young man of twenty-six. It was produced with great success at Dresden in 1842, and was followed by *Der fliegende Holländer* (The Flying Dutchman), which did not meet with the same approval and two years later, in 1845, *Tannhäuser* proved a failure. In 1848 he finished *Lohengrin*; but in the following year, W., who had involved himself in the political agitation of the time, was forced to quit Saxony. He escaped to Zürich, where he remained till 1859. *Der Ring des Nibelungen* (1853-



74), his great tetralogy, was begun before he left Dresden, but before he completed it he turned aside to write *Tristan und Isolde*, written under the influence of Mathilde Wesendonk. In 1861 he received a pardon and returned to Germany. *Tristan* was produced at Munich in 1865. From the end of 1862 W. was in Vienna until 1864, when he was threatened with imprisonment for debt. He was invited then by Ludwig II. of Bavaria to Munich. There W. fell in love with Hans von Bulow's wife Cosima (Liszt's daughter), and the scandal was exploited by those of the court who feared his influence on the young king. Obligated to leave Munich, W. went to Switzerland, where Cosima joined him in 1866. After her divorce in 1870 they were married. W.'s first wife having died in 1866. *Die Meistersinger* was produced in Munich in 1868, and W. then continued work on the *Ring* cycle, abandoned many years before. In 1876 the entire *Ring* was performed at Bayreuth, in a building specially erected for the purpose. His last work, *Parsifal* (1882), was a drama founded on the story of the Holy Grail.

W.'s influence permeates the period of the later nineteenth century, affecting many of his contemporaries and successors. He prevailed by sheer force of will, regarding his new type of opera, the music drama, as the final art-form, to which music, poetry, and painting were all subservient; but his symphonic treatment and orchestration transcends the poetry. His early opera *Tannhäuser* shows the influence of Meyerbeer but he soon becomes a disciple of Weber, though in his allegorical romances between 1843-45 (*Der Fliegende Holländer*, 1840-41, *Tannhäuser*, 1844-45) he can challenge comparison with his master. In the later allegorical sequence (*Das Rheingold*, 1853-54; *Die Walküre*, 1854-56; *Siegfried* (begun in 1857, resumed, and completed in 1869); *Tristan und Isolde*, 1857-59; and *Hölderlin's Dämmerung*, 1870-74, and the sacred drama *Parsifal*, 1882), there is a final advance to the fully evolved music drama, in which the 'endless melody' is now abbreviated into the 'leading motive' and the whole score is woven out of these motto themes.

His pub. writings and letters include *Schriften und Dichtungen* (10 vols., 1871-83, 1911); *Die Kunst und die Revolution* (1849); *Das Kunstwerk der Zukunft* (1850); *Oper und Drama* (1851); *Über das Dirigieren* (1869); *Letters* (ed. by W. Altmann, 1905; Eng. trans. 1927. Selection trans. by M. M. Bozman, 1936). The W. bibliography is enormous. All biographies have been superseded by Ernest Newman's *The Life of Richard Wagner*, 4 vols. (1937-47). A shorter modern Eng. work, with a critical study, is by Robert Jacobs (*Master Musicians*, 1935).

**Wagram**, vil. near Vienna, Austria. Here was fought the battle of W. (July 1809), in which Napoleon, with the co-operation of his generals, Masséna, Davout, and Oudinot, defeated the Austrians under the Archduke Charles.

**Wagtail**, genus of insectivorous, passerine birds (*Motacilla*), related to the pipits. There are three species in Britain: the pied W. (*M. lugubris*), the grey W. (*M. boarula*), and the yellow W. (*M. rari*). The white W. (*M. alba*), and the blue-headed W. (*M. flava*) are migrant. See S. Smith, *The Fellow Wagtail*, 1950.

**Wahabis**, see under ARABIA.

**Waiblingen**, see GUELPHS AND GUIBEL-LINES.

**Waikato**, riv. (200 m. long) of N. Island, New Zealand. Rising to the S. of Lake Taupo, which it drains, it flows N.N.W. and finally W. to Port Waikato on the W. coast, where it enters the Pacific.

**Wailing** (or **Western**) **Wall**. Only two relics of the Temple of auct. Israel are extant, (1) the 'foundation stone,' also known as es-Sakhra, or the sacred rock, to-day covered by the Kubbet es-Sakhra, or 'Dome of the Rock,' and (2) the W.W., a portion of the wall which used formerly to surround the Temple, which was situated in the area of the present Haram esh-Sherif ('the Noble Sanctuary') in Jerusalem. The nine lowest courses of the W.W. consist of huge blocks, as was characteristic of Herodian (Herod the Great, 37-4 B.C.) masonry, the largest one being 16½ ft. long and 13 ft. wide. Above are fifteen courses of smaller stones. The W. reaches the height of c. 60 ft. The W.W. is named by the Jews the 'Kotel Ma'arabi' or 'Western Wall,' and only by Gentile onlookers has it been associated with 'wailing,' and that because the Jews recite there, along with other items of ritual, the Book of Lamentations in a loud voice. The Jews, indeed, assert that the W.W. is the most anct. and most sacred devotional shrine of the Jew, and that he possessed and worshipped at it centuries before Islam came into existence, thus giving him a prescriptive right of nineteen centuries' duration. The Muslims of to-day assert that the wall and its adjoining pavement are an integral part of the shrine which ranks next to Mecca and Medina in sanctity.

**Wainfleet**, tn. in Lincolnshire, on Steeping R., 5 m. from Skegness. It was the bp. of William of Waynflete, bishop of Winchester, founder of Magdalen College, Oxford, and of the Granman School of W., built in 1459. Pop. 2500.

**Waits**, originally night watchmen who carried musical instruments. The term, however, came to be applied to musicians who had no watch duties, and now signifies the bands of street musicians who play at Christmas time.

**Wakarham Language**, see under NORTH AMERICAN NATIVE LANGUAGES. *Pacific area*.

**Wakatipu**, lake of S. Island, New Zealand, in Otago (q.v.) prov. It is 25 m. long, 1212 ft. deep, and 1016 ft. above sea-level.

**Wake** (Old Eng. *wacu*, a watch); or **Lyck-wake** (Old Eng. *lyc*, a body), anct. observance by which the body of a dead person was watched all night by friends and relatives. Wa. were also observed on the eves of saints' days, and became

fairs, as in Lancashire, and at Bradford (where they were known as tides). Ann. holidays are still called Ws. in Lancashire. The corpse W. survives in Ireland.

**Wakefield, Edward Gibbon** (1796-1862), Eng. colonial statesman, b. in London, educated at Westminster and Edinburgh High School. He served in the Brit. embassies at Turin (1814-16) and Paris (1820-26). When in Newgate Gaol, serving a term for abduction of his second wife, he wrote *The Letter from Sydney* (1829), exposing the evil effects of 'transportation' and roughly sketched a system of colonisation. He formed a colonisation society in 1830, and the Bill to erect S. Australia into a Brit. Prov. followed as a result. The scheme failed, but in 1837 he turned his attention to the acquisition of New Zealand as a Brit. colony, first in face of much gov. opposition, but with its support when there was a threat of Fr. occupation.

There were flaws in W.'s theories, but fundamentally his ideas were sound, and the New Zealand settlements achieved prosperity more rapidly than any of their predecessors elsewhere. W. wrote *View of the Art of Colonisation* (1849), and ed. Smith's *Wealth of Nations*. There is an ed. of some of his writings in Everyman's Library (1929). See lives by R. Garnett, 1898; H. J. Harrop, 1928; and V. Harlow, *Origins and Purpose*, 1944.

**Wakefield**, city, co. bor., and cap. of the W. Riding of Yorkshire, England, on the R. Calder, 9 m. S.E. of Leeds. There are good rail and canal communications. A medieval tn. of some importance, W. became a prominent centre for the cloth trade in the sixteenth century. It became a municipal bor. in 1848, a city in 1888, and a co. bor. in 1914. It returns one member of Parliament.

Richard, duke of York was defeated and killed by the Lancastrians at the battle of W. in 1460. In 1888 a diocese was created, the par. church of All Saints becoming a cathedral. The church is of the fifteenth-century Perpendicular style with a distinguishing crocketed spire (247 ft.), the tallest in Yorkshire. On the old bridge over the Calder stands the chapel of St. Mary, rebuilt in 1847 in a rich Decorated style. W. was the bp. of Dr. Radcliffe, and George Gissing. The grammar school is said to be the descendant of a thirteenth-century school; it was founded by a royal charter of Elizabeth in 1591.

The industries of W. include worsted spinning, woollen manu., shirt and blouse-making, wire-drawing, coal-mining, and the manu. of engineering and machine-tool products, chemicals, glass, and sheet metal. The administrative offices of the W. Riding co. council are situated here. The prison at W. has become well known for its progressive policy. Pop. 60,000.

**Wakley, Thomas**, see LANCET.

**Walbrzych** (Ger. Waldenburg), tn. in Silesia, Poland, 43 m. S.W. of Wrocław. Porcelain, firebricks, and stoneware are produced. Pop. 64,100.

**Walburga**, see WALBURGA.

**Walcheren**, is. in Zeeland prov., Holland, lying between the E. and W. Scheldt. The chief tns. are Middelburg and Flushing (q.v.). By occupying the is. it is possible militarily to deny the use of Antwerp to an opponent.

In Oct. 1944 Antwerp was in Brit. hands but Gers. on Walcheren controlled the mouth of the Scheldt. The R.A.F. breached the dykes by bombing and almost completely flooded W. On Nov. 1, commandos and part of 52 Div. landed on the is. and cleared it by the 10th. The last part of the dyke-breach was closed in Feb. 1946 and in the same year a harvest was reaped from the reclaimed land.

**Waldeck**, or **Waldeck-Pyrmont**, former principality of Germany consisting of W. enclosed by the Prussian provs. of Westphalia and Hesse-Nassau, and Pyrmont surrounded by Hanover, Lippe-Detmold, and Brunswick. In 1919 W. became a State of the Ger. Republic with a separate constitution. In 1929, however, W. was merged into Prussia.

**Wake-robin**, another name for cuckoo-pint. See under ARUM.

**Waldemar** (kings of Denmark), see VALDEMAR.

**Walden, Paul**, see WALDEN INVERSION.

**Waldenburg**, see WALBRZYCH.

**Walden Inversion**, discovered in 1895 by P. Walden, the Russian chemist, refers to the change in sign of optical activity occasionally observed when an optically active compound is converted into a derivative; such an inversion is uncommon, and the study of cases where it exists has thrown light upon molecular architecture. See STEREOCHEMISTRY.

**Waldenses**, or **Vaudois**, religious body initiated about 1176 by a rich merchant of Lyons, Peter Waldes. At first a movement for voluntary poverty, it gradually developed unorthodox doctrines, some borrowed from the Cathari. Spreading through Provence, Lombardy, and N. Spain, the W. were subjected to intermittent persecution for centuries. See K. Algrinissen, *Konfessionskunde* (5th ed.), 1939.

**Waldorf, William**, see ASTOR, VISCOUNT.

**Waldron, George**, see BARRINGTON, GEORGE.

**Waldteufel, Emil** (1837-1915), Alsatian composer, b. at Strasburg. He became court pianist in Paris, and achieved great popularity by his waltzes.

**Wales, Edward Albert Christian George Andrew Patrick David, Prince of**, see EDWARD VIII.

**Wales, Prince of**. The eldest son of the king of England, becomes at birth duke of Cornwall, and on his succession to the throne the duchy vests in his eldest son; but the king can, if and when he chooses, create his son P. of W. and earl of Chester by letters patent. It is now customary always to make the heir-apparent to the throne P. of W., but the title is not heritable. The life of the P. of W. and the chastity of his wife are protected by the Statute of Treasons (see TREASON). Provision is made for the Prince and Princess of Wales by the Civil List Act, 1901.

**Wales**, anct. principality, westerly sector of Great Britain, bordering on the Eng. cos. of Cheshire, Shropshire, and Herefordshire and Monmouth (but for many administrative purposes the last-named may be regarded as part of W.). Its place-names are Welsh, and its people regard themselves as Welsh. This article deals with Welsh geography, history, language, literature, and art. For pop., industries, and local gov. and administration see ENGLAND AND WALES.

**Geography.**—The boundary between England and Wales follows the edge of the highland, which itself coincides roughly with the division between the hard, old rocks of the W. from the softer, newer rocks of the Eng. midlands. In S. Wales the structure lines run from W. to E. The highest mts. of this region are the Brecknock Beacons (2910 ft.). The rivers, in the E., i.e. Usk, Taff, and Neath, flow from N. to S., those in the W., e.g. Towy and Teifi, however, follow the grain of the land, flowing N.E. to S.W., and in their lower courses from E. to W. In central and N. Wales the structure lines run from N.E. to S.W. and valleys divide the high land into four sub-regions, viz.: Anglesey and the N. coastal plain; the Snowdon Range in Carnarvonshire and the Arenig range in Merioneth; the Berwyn range; and central Wales lying between the Usk and the upper Severn. Snowdonia, the group of mts. near Snowdon, are wild and rugged with steep slopes, the scenery resembling that of far higher mts. of other countries. The hills further S., in central Wales are more rounded and gentle in outline. The heavy rainfall and numerous lakes suitable for storage reservoirs make Snowdonia a possible source of hydro-electric power. Between the S. Wales coalfield and the sea lies the Vale of Glamorgan, a mixed farming area, presenting a sharp contrast to the coalfield valleys and to the barren flat-topped sheep moors of the Brecknock Beacons to the N. of the coalfield. The coastal plain has long been a communications route between S. England and Ireland; and Cardiff, Newport, and other tns. grew up around castles erected by the Normans near the lowest crossing places of the rivers. Central Wales is very thinly populated, and sheep-rearing is the main occupation. N. Wales, with a mild climate and beautiful scenery is a favourite holiday resort; along the N. coast, where the mts. come close to the sea, are a number of holiday tns., of which the chief are Llandudno, Colwyn Bay, and Rhyl.

**History.**—Throughout its early hist., as in later periods, the human settlement of W. has been dictated by the geographical personality of the countryside. It is part of the Highland Zone of Britain, a land chiefly of mt. and high plateau which consists of Palaeozoic rocks; its connections with the E. parts of Britain facing the Continent are less than with Ireland, and the famous W. sea-route which brought the Mediterranean into touch with Scandinavia. Native cultures persisted for many centuries after they had

been replaced in Lowland Britain. An outstanding example is the round hut circles of the Bronze Age in N. Wales which were absorbed into the cultures of the Early Iron Age and continued in use well into Romano-Brit. times. At the same time, the prehistoric settlement of W. was also governed by the height of the human habitation line on the mt. sides, and by the presence of coastal plains in the S. and South-West.

The Lower Palaeolithic is not represented in W., but later stages are known in the caves of N. Wales in the Vale of Clwyd, and particularly in Gower, where, in Paviland Cave, Dean Buckland discovered the oldest human burial yet known in Britain. The food-gathering economy of the Mesolithic is represented in N. Wales, and particularly at Prestatyn, Flintshire.

W. is rich in remains of chambered tombs, cairns, and other megalithic monuments. There are many examples of stone circles. From detailed study, archaeologists have been able to recognise a distinctive megalithic culture centred round the Severn. Settlement of W. in the Bronze Age came from the Cotswold-Somerset area to the S. coastal plain, and from Ireland.

So rapid was the domination of lowland Britain that within four years the Rom. army was estab. on the frontier of S. Wales, and, by about 75, the Second Legion was estab. in its fortress at Caerleon (*Isca Silurum*) in Monmouthshire. This fortress was excavated 1914-28, and its place in the story of Rom. W. is now well known. With the legionary fortress at Chester, it became a base of military occupation by troops stationed in auxiliary forts. There was a considerable rebuilding of forts in stone in the second century, but about 120, much of the Welsh police garrison was withdrawn by Hadrian for employment on the rebuilding of the Wall. At Cardiff was estab. one of the forts of the Saxon Shore, designed for defence against sea rovers. Apart from the areas of military occupation, native life was not much influenced by the Romanisation felt elsewhere.

The Celts accepted Christianity in about A.D. 200, and they maintained this faith when the rest of the is. was re-paganised. On the conquest of Britain by the Saxons (c. 450-600) the Celts were driven back into the W. corners of the is., Cumberland, W., and Cornwall. Henceforth W. became the main stronghold of the Celts or Britons. Powerful native princes arose in W., and extended and consolidated their dominions. Among the most notable of these were Cadwallon the Long-Handed and his son Maelgwn Gwynedd. The Welsh people were for a time united under the latter's grandson, also named Cadwallon. The Britons of W. for some centuries made repeated attempts to recover the N. parts of England from the Saxons, but their defeat by Ethelfrith, the Angle king, of Northumbria, at the battle of Chester (c. 613), severed Strathclyde and all N. Britain from W. Cadwallon made

one great attempt to recover the N. and to win the crown of Britain but died fighting for it in 635, leaving to his son, Cadwaladr, a distracted and plague-stricken country. This ill-fated Cymric attempt to continue the political unity bequeathed by Rome to the west, found expression in the Arthurian romances and these gradually dominate Welsh political thought. This same period was one in which monasticism made great progress in the country and also gave W. a patron saint, St. David, who represents the final victory of Christianity over a host of pagan deities.

After the death of Cadwaladr, king of Gwynedd, in 635, the struggle for the recovery of the N. of Britain was abandoned for ever. For the next 600 years the struggle was between a king who regarded himself as the champion of the Britons, wearing 'the crown of Arthur,' and the princes who were descended from the tribal princes. For this period the chief source of information is the *Chronicle of the Princes* written about the first half of the fourteenth century probably at the Cistercian abbey of Strata Florida in Ceredigion (Cardigan). Then came a period of internal strife and Saxon aggression. W. being apportioned among its many petty princes. The country was once again united under Rhodri the Great (844-77), who successfully resisted the onslaughts of the Danes, but was himself defeated and slain by the Mercians. On his death his dominions were again divided among his three sons, Anarawd, Mervyn, and Cadell. The next important Welsh prince was Howell Dda or Howell the Good (909-50), who made himself master of the greater part of W., but did homage to King Athelstan of England. He also collected and codified an elaborate system of laws by which the people were divided into the royal class, the free tribesmen, and the non-tribesmen. From 950-1010 no supreme king ruled in W., but there were constant struggles between various petty local princes, as well as many raids on the part of Danes and Saxons. This period of anarchy was followed by the rule of two strong princes, Llewelyn ap Seisyllt and his son Griffith (Gruffydd). Llewelyn did much to reunite his country, which he completely freed from Dan. raids. Griffith (1039-63) was a monarch of great energy. He expelled the Saxons from Gwynedd, conquered S. Wales, consolidated his dominions, and made war against England. Eventually Harold of England subdued S. Wales and defeated Griffith (1063).

The Norman conquest of England (1066) had at first little immediate effect upon Wales. But it was not long before the Norman kings began to make encroachments, in particular placing on the Welsh borders a number of powerful barons who took advantage of the disorganised state of W. to expand their territory. The next two centuries (roughly, 1066-1282) form an epoch of continual struggle against Norman aggression. In 1094 there was a brief and transient Welsh revival, led by Cadwgan ap Ble-

ddyn, who united the Welsh people against the Normans. At length Henry I. made a determined effort to anglicise W., which he attacked simultaneously with three armies, reducing most of the Welsh princes to submission. They recovered much of their lost ground, however, during the civil wars of Stephen's reign.

During almost the whole of Stephen's reign and a great part of that of Henry II, the dominant figure in W. was Owen Gwynedd (who reigned from 1137 to 1169) son of Gruffydd ap Cynan. Between his death and the ascendancy of Llewelyn the Great, Davydd, Owen's son, tried to maintain some show of supremacy over the chiefs of Gwynedd, but in the last quarter of the twelfth century, when Henry II. was endeavouring to curb the power of the border barons and at the same time to subjugate the Welsh princes, the chief figure in Welsh hist. is not Davydd I., Lord of Snowdon, but Rhys ap Griffith, Lord of the Vale of Toway and son of Griffith ap Rhys (d. 1137). Rhys ap Griffith had defied both Owen Gwynedd and Henry II., but when Henry invaded W. in 1157 he made common cause with Owen, and Henry's army had to retreat. It was the rise of a new power in Ireland in the time of Strongbow that lessened the pressure on Rhys and thereby conduced to peace between him and the king. It was indeed largely through the co-operation of Rhys ap Griffith (1132-97), now his ally and vassal, that Henry succeeded in establishing some semblance of order in W., and he recognised this fact by making him justiciar of S. Wales.

Meanwhile, before the end of the twelfth century, the Welsh Church had been merged completely in the Church of England and had lost all independence in internal affairs. A formidable stand was made for independence in eccles. matters by the celebrated Giraldus Cambrensis (1147-1223), but without ultimate success.

The most significant figure in medieval Welsh hist. was Llewelyn ap Iorwerth (the Great) who reigned from 1194 to 1240. In daring generalship he was the equal of Cadwaladr, and in cautious statesmanship not inferior to Owen Gwynedd. For nearly half a century W. in his lifetime was spared the frequent reaction against centralisation which generally ensued on the close of the rule of a strong prince. He was a powerful force on the side of the barons in their struggle with King John and in fact some three clauses of Magna Carta declare his privileges and recognise the independence of the law administered by him. At first, Llewelyn encountered difficulties from the jealousies of members of his family, but he overcame most of these difficulties through his alliance with John, reinforcing his alliance by his marriage with Joan, the daughter of the Eng. king. Llewelyn, however, was shrewd enough to realise that England was ultimately invincible, and at the end of his life he tried to secure for W. the continuation of peace by placing the country

in feudal dependence on the king of England, by a treaty made through the bishops of Chester and Hereford. By this treaty he gave away the semblance of Welsh independence while retaining the reality of it, but this involved the succession of Davydd, his son by an Eng. mother and the cousin of the king, and the disinheriting of Griffith, born of a Welsh mother. Griffith was able and forceful, whereas Davydd was not and the sympathies of many in W. were with Griffith and with his policy of hostile independence of England. Llewelyn could not reconcile his sons; he retired to the Cistercian monastery at Aberconway, where he d. (1240).

On Davydd's death in 1246 there were four claimants to the Welsh crown: Owen and Llewelyn, the sons of Griffith; Ralph Mortimer who had married Gladys, daughter of Llewelyn the Great, and who at his death left his estates and claim to his son, Roger; and Edward, the king's son, later to become Edward I.

A settlement was reached in 1267 when Henry and Llewelyn met at Montgomery and there was ratified the treaty which gave W. peace under the recognised rule of Llewelyn. On the death of Henry (1272) Llewelyn refused to take the oath of fealty or to do homage to Edward, who at that time was absent on the Crusades. After his return to England, Edward, in 1275, appeared with an army at Chester. The following year Edward made great preparations for a war of annihilation against Llewelyn and in 1277 his army closed round W. Llewelyn realised the hopelessness of continuing the struggle and submitted to the humiliating terms of the treaty of Rhuddlan (Nov. 10, 1277). He did homage to Edward at Westminster in 1278, but a few years later again broke out into revolt. Edward once again invaded W. and overran the country. Finally Llewelyn was killed in a chance encounter (1282).

From this date W. ceased to have any separate political existence. The conquest of the country brought into the king's hands the gov. of the principality and of those chieftains in S. Wales who had become Llewelyn's adherents. In all these lands gov. by princes was replaced by that of the king's officials. Llewelyn's principality became six shires: Anglesey (the former is. of Mon), Carnarvon, Merioneth, Flint, Cardigan, Carmarthen. Snowdon was surrounded by new castles. The young prince Edward, born at Carnarvon, was the new Prince of Wales and to him was given the honour of offering Llewelyn's coronet at the shrine of Edward the Confessor at Westminster.

Throughout Edward II's reign a struggle went on between the new official class and the conquered people. Edward, however, was popular with the Welsh, for he regarded himself as a Welshman. His ordinances were just and he summoned Welshmen to Parliament. Edward might have retained the affection of his Welsh subjects, but he alienated their sympathy by favouritism.

The period which followed from 1350

to 1400 was one of disintegration, due mainly to the tyrannies and exactions of the great marcher barons. The most formidable rising in Wales against the new order and the tyranny of the border barons was the great national movement associated with the name of Owen Glendower (fl. 1400-15). By fighting in his own private quarrel, he became the leader of the widespread revolt which terrified all in authority at the time and left behind it a more enduring impression on Welsh legends than any other political or social movement. In 1404 Glendower was supreme in W., holding his own Parliament; his political ideals being an independent W., under prince and Parliament, an independent Church, with St. David's as its metropolitan see, and the organisation of the new learning through Welsh univs. All his political ideals vanished with his death, save a vague sense of nationality.

The priu. results of these risings and of the havoc wrought by the wars of the Roses were the destruction of the feudal system, the prevalence of robbers, the appropriation by Englishmen of all positions of trust, the enactment of many severe and unjust laws against the Welsh, and the consequent growth of bitter racial feeling. The border barons continued to make unjust exactions, and the rights of citizenship were withheld from the Welsh people. Nevertheless, this period of oppression corresponds in point of time with the golden age of Welsh poetry.

The chief movements in Tudor times in W. were the political reorganisation, the reform of the system of justice, and the religious reformation, to the last of which there was passive resistance. The political reorganisation was the work of Thomas Cromwell. The Act of Union of 1535 united W. to England and by its operation the former was politically assimilated in all respects to the latter. The liberties as well as the laws of England were extended to the Principality, and W. was now for the first time given parl. representation. On the other hand, the Welsh language was completely banished from the courts, and many old Welsh customs were abolished. One great benefit of the Act was the conversion of the marcher lordships into shire ground, the new shires being Brecknock, Denbigh, Monmouth, Montgomery, and Radnor, while the shires of Glamorgan, Pembroke, Carmarthen, Cardigan, and Merioneth were enlarged.

*Religion and Education in Wales.*—In matters of religion W. was not at first very greatly affected by the Reformation. During the seventeenth century the Baptist movement was estab. in W. At the beginning of the Methodist revival about 1730 the country experienced a real religious awakening. The ferment of the Methodist movement spread over W. with lightning rapidity and culminated in a movement to secure Methodist secession from the Church of Wales. The question was only settled in 1914 by the Act of Disestablishment and Disendowment of the Church in W. Owing to the

First World War, however, the Bill did not come into operation until 1920. The Church in W. now has its own governing body of bishops, clergy, and laity, and its first archbishop, Bishop Edwards of St. Asaph, was elected at the first meeting of the governing body; the present archbishop (1950) is Dr. John Morgan. Two bishoprics have since been added, in Monmouth (1921), and Swansea and Brecon (1923). The other dioceses are those of St. Davids, Llandaff, and Bangor. The Rom. Catholic prov. of W. is composed of the archbishopric of Cardiff and the bishopric of Menevia. The Univ. of W. estab. in 1893, has four centres, in the form of constituent colleges, at Aberystwyth, Bangor, Cardiff, and Swansea, while tutorial classes are conducted throughout the country under the aegis of the Univ. A notable acquisition in public buildings is the celebrated National Museum of W. (Amgueddfa Genedlaethol Cymru), which was opened by George V. in 1927. The religious revival led indirectly to a great though gradual national awakening which has since borne diverse and abundant fruit in a social, literary, and industrial revival.

Welsh nationalism has been effective in the cultural sphere through such institutions as the Eisteddfod and the Univ. of W., by the use of the Welsh language, and by the estab. of a separate Welsh broadcasting region, but politically has found little support. There is also an International Eisteddfod held annually at Llangollen. The gov. in 1948 rejected the scheme of a separate ministry for W., and an Advisory Council, of somewhat ill-defined functions, was estab. A Welsh Nationalist party, aiming at a separate Welsh Parliament, exists. The movement *Urdd Gobaith Cymru* (League of Youth) is non-political in character and was founded by Sir Ifan ap Iwan Edwards, to protect the Welsh language.

*Welsh Language and Literature* — Welsh or Cymric (together with Breton and Cornish), belongs to the Brythonic subdivision of the Celtic branch (Gaelic, i.e. Irish and Scottish and Munx form the Goidelic subdivision), of the Indo-European languages (*q.v.*). The language is phonetically written, and the accent is generally on the penultimate syllable. The Welsh alphabet contains 28 letters or combinations of letters (*ch, dd, ff, gg, ll, ph, rh, th*). The earlier Welsh verse-material seems to contain sixth century elements, but the earliest glosses and preserved poems are attributed to the ninth to eleventh centuries. Only from the twelfth century onwards has there been produced a vast amount of Welsh literature, which is still preserved. Up to the Tudor period Welsh was spoken by the upper and the lower classes. Two causes have kept the Welsh language alive up to the present day, the isolation of the people among the mountains, and religion. The Snowdonian region (Eryri) was never conquered by England, nor has there been any incentive for any other people save the Welsh to take possession of the Carnarvonshire mountains. The Welsh

language, however, might have died soon, but for the efforts of men like John Penri, who in Elizabeth's reign gave his life for his language, with the result that the Bible was trans. into Welsh in 1562. That saved the native tongue for some generations. The Methodist revival of Welsh in the eighteenth century gave birth to an educational system the development of which is not even yet completed. Schools sprang up in the wake of the preachers. The Bible was sold for a few pence, and the language was saved. Now Welsh is taught in the primary and secondary schools, and its study forms one of the most popular branches at the Welsh Univ. colleges. The pub. of the first part of Prof J. M. Jones's *Welsh Grammar* in June 1913 was a notable event in the progress of the new national spirit of W. The desire of the modern scholars was to bring uniformity into the spelling, to re-introduce some of the strong and beautiful words of medieval Welsh, to abolish the Latinisms introduced by the scholarly translators of the Bible, and to revert to the standard of pure Welsh prose as it was written by Elis Wyn in his *Bardd Cysg* of 1703. In the nineteenth century the *Eisteddfod* (*q.v.*) became an ann. national event, and there can be no doubt of its influence in keeping alive in the Welsh people a keen appreciation and understanding of their language.

The earliest period of Welsh literature is that of the *Cynfeirdd* or early poets. Much of their work is anonymous, but the major part is associated with the names of Aneurin (*q.v.*), Taliesin (*q.v.*), Myrddin, and Llywarch Hên, poets of the late sixth and seventh centuries. Their poetry survives in the 'Four Ancient Books of W.': the Black Book of Carmarthen, the manuscript of which belongs to the twelfth century, the Book of Aneurin and the Book of Taliesin (thirteenth century), and the Red Book of Hergest (see HERGEST, RED BOOK OF) (late fourteenth century). (See also TRIAD.) Aneurin is the reputed author of the *Gododin*, a lyrical epic of battle. The next period is that of the *Gogynfeirdd* or the medieval poets, the court poets of the Norman period, chief among whom were Gwalchmai and Prince Ilywel ap Owain. This was the period of the bardic schools which elaborated the rules of versification that have now become traditional in Welsh poetry. In the eleventh and twelfth centuries, Gruffydd ap Cynan, who came from Ireland in 1080, reorganised the bards and improved the music, and in other ways gave a great and beneficial impulse to Welsh literature. According to Welsh writers, one of the changes he effected may have been the institution of bardic *gorseddau* or meetings, of which the modern *Eisteddfod* is an imitation. The highest reputation among the bards belonged to Cynddelw, 'the great poet.' It was during this period that written form was first given to the eleven great romances, known as the *Mabinogion* (*q.v.*). The next or third period is dominated by the genius of Dafydd ap Gwilym (*q.v.*) (c. 1320-80), who wrote in a simpler style than the

bardic poets and developed a new form of metre in his *cywyddau* or lyrical odes. The first *Eisteddfod* was held in the fifteenth century although tradition places similar events at a much earlier date. The metre of the bardic poetry and of the *cywyddau* was strictly unaccentual. The anglicisation of Welsh culture in the sixteenth and seventeenth centuries led to the introduction of accented or so-called 'free' metres, brought to considerable perfection by Richard Hughes who was at the court of Queen Elizabeth, and later by Huw Morus (1622-1709), who was the greatest figure in Welsh literature in his day. During the course of a long life he wrote political and satirical verse as well as love-poems and religious songs. He was a Royalist, and opposed to him in politics was his contemporary, Morgan Llwyd (1619-59), who also wrote political verse in the free metres. He is chiefly remembered, however, for his prose writings, including his translations from Boehme. Apart from the work of these poets, Welsh poetry was in decline, flourishing only in popular ballads or folk-songs and in religious verse. One writer of hymns was Elis Wyn (1671-1734), whose fame, however, is more secure as a master of Welsh prose. His great prose work *Gweledigaethau y Bardd Ciesc* (*Vision of the Sleeping Bard*) was pub. in 1703, and although borrowed in idea from the Spanish of Quevedo, it is so native in its colour, speech, and idiom that it is set to-day as a model for all generations to copy. The religious movement was the chief but not the only influence in the revival of Welsh literature in the eighteenth century. There was at the same time a growing antiquarian interest, to which the two present-day Welsh societies, the Cymmrodorion and the Gwyneddigion owe their origin. The Gorsedd or Court of the Poets also came into existence with its arch-druid as president, its druids, bards and evocates. The return to the traditional literature found its chief exponent in Goronwy Owen (d. 1769). His greatest poem was his ode *To the Judgment Day* (*Cywydd y Farn Fawr*). Greater popularity, however, was won by the dramatic interludes written by Thomas Edwards (1739-1810), whose bardic name was Twm o'r Nant. These poets wrote mainly in the 'strict' traditional metres. The 'free' verse, however, reached a new perfection in the work of Alun (John Blackwell, 1797-1840). After him came the two outstanding poets of the nineteenth century, Ceiriog and Islwyn, the bardic names of John Ceiriog Hughes (1832-87), and William Thomas (1832-78) respectively. Ceiriog, who has been compared to Burns as having a similar place in the national literature, wrote lyric poetry derived from peasant life. By contrast, Islwyn was a mystical writer with little lyric feeling. These two poets were at the head of a renaissance of Welsh literature, to which a further impetus was given in the twentieth century through the research and scholarship and above all by the poetic example of Sir John Morris Jones

(1864-1929), who was Professor of Welsh at Bangor Univ. Among his followers on what has come to be known as the Bangor school of poetry are numbered two of the foremost writers of the present time: Thomas Gwynn Jones (1872-1949), and W. J. Gruffydd (b. 1881). A high degree of literary accomplishment distinguishes Gwynn Jones, whose Arthurian poem won the chair in the *Eisteddfod* of 1902. He wrote in both the strict and free metres, being particularly successful in the former. Other major poets associated with the Bangor school are R. Williams Parry, who, like Gruffydd, represented a neo-paganism, and T. H. Parry-Williams, a more austere and philosophical poet. An older contemporary, less modernistic in his approach, as is shown by his preference for a bardic name, is Elfed (Rev. H. Elfvet Lewis, b. 1860). He and other poets of the time from S. Wales may be less intellectual and scholarly than the 'new poets' of the Bangor school, but they write simply and in the traditional manner, moving poems descriptive of Welsh communal life. Elfed and Eifion Wyn (E. H. Williams, 1867-1926) were in fact judged the most popular of Welsh poets of this century. Among the poets whose reputation belong chiefly to the First World War, are Cynan (Rev. A. E. Jones), Hedd Wyn (Ellis Evans, 1887-1917), and T. E. Nicholas. Although in more recent years a number of Welsh poets have made their reputations in English, mention must be made of some of the younger poets whose work shows that Welsh poetry is still a living force and by no means an academic exercise in a forgotten idiom. They include E. Prosser Rhys who in collaboration with J. T. Jones won the crown at the *Eisteddfod* in 1924, also Caradoc Prichard, whose poems were also crowned, Iorwerth C. Peate, Wyl Iwan (William Evans), W. R. Hughes, D. G. Jones, G. J. Williams, Saunders Lewis, also a notable prose writer, and many others.

In prose Welsh literature is by no means so outstanding. The prose romances of the *Mabinogion* had few successors. The novelist, Daniel Owen (1836-95), whose studies of Welsh home life are still acknowledged to be in the front rank, was the pioneer of modern Welsh fiction, whose tradition is represented to-day by Thomas Rowland Hughes (his *O Lar I Lar* was pub. in Eng., 1950), Kate Roberts, and Geraint Owen. Welsh writers in Eng. include Richard Llewellyn, Rhys Davies, Gwyn Jones, Hilda Vaughan, Dylan Thomas, and Cledwyn Hughes. In literary criticism the father of the modern school is Evans ap Iwan (R. A. Jones, 1851-1906), whose successors include the two writers, already mentioned above in connection with their poetry, W. J. Gruffydd and T. Gwynn Jones.

*The Arts.*—The arts of W. are the arts of poetry and song. Artists from W., however, have at times played notable parts in the development of Brit. art. Among painters the most prominent is Richard Wilson, whose achievement it

was to graft the Eng. landscape school onto that of the Continent, and whose influence was a decisive factor in the development of the former. Mention must also be made of the engravers Robert Walker and John Jones, and the sculptor John Gibson. Twentieth-century artists include J. D. Innes, Augustus John, Sir Frank Brangwyn, David Jones, and Sir Wm. Goscombe-John.

In the field of applied arts it is noteworthy that the remoteness of W. has fostered, and until recently preserved, native traditions in craftsmanship. In the peasant arts of the builder, weaver, wood-turner, and quilter, widespread European conceptions receive an individual national expression. The Welsh tradition in wrought ironwork attained its finest flowering with Robert and John Davies in the eighteenth century: but that the arts of metalwork also fl. in W. in a far earlier age may be inferred from the splendid examples which she had furnished of the La Tène art of the early Iron Age. Lastly mention must be made of the japanned tinware made at Pontypool and Usk in the eighteenth and early nineteenth centuries, and the brilliant pottery and porcelain made at Swansea and Nantgarw early in the nineteenth century.

**Music.**—Welsh Music attained a high cultural standard in very early times, being upheld by the bards. Harp-tunes were the chief form of Welsh music, and Penillion, competitions in which songs were improvised to a harp accompaniment, formed a great feature of Welsh life. These competitions and the activities of the bards are still continued in the Eisteddfods of to-day.

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and C. P. Holland (ed.), *Music in Wales*, 1949.

**Wales, Calvinistic Methodist Church in, or Presbyterian Church of, is Calvinistic in its doctrine and Presbyterian in its organisation. It is modern in its origin, and owes its beginnings chiefly to the preaching of Howell Harris and others from 1735 onwards. Later, George Whitefield came into touch with them and aided them in their work. The connection, however, between the Eng. and Welsh Methodists ceased before 1750. Its first Ordination Service was held in 1811. The C.M.C. in W. has 1633 churches and chapels, etc., and 162,538 communicants.**

**Wales, University of, founded in 1893 from a union of the colleges of Aberystwyth, Bangor, and Cardiff. Those three still remain the constituent colleges of the univ., none taking precedence of the others. In 1920, Univ. College, Swansea, was admitted to the univ. The Welsh National School of Medicine is situated in Cardiff. There are associated theological colleges at Brecon, Aberystwyth, and Carmarthen, and schools of theology at Cardiff and Bangor. The univ. grants degrees in almost all subjects. There are over 5000 students, also univ. extension courses.**

**Walfish Bay, see WALVIS BAY.**

**Walhalla, see VALHALLA.**

**Walker, Horatio (b. 1855), Canadian artist, b. at Listowel, Ontario. An association with Robert Gagen induced an interest in water-colour, a medium he later gave up for oils. In 1888 he won the Evans Prize of the Amer. Water-Colour Society. His subjects are chiefly landscapes and farm scenes. His pictures generally have a fine atmospheric quality, are composed in a broad and simple manner reminiscent of Millet.**

**Walker, tn. in the co. of Northumberland, England, 3 m. E. of Newcastle, on the R. Tyne. Manufs. chemicals and has iron foundries and shipbuilding. Pop. 15,800.**

**Walking, see under ATHLETICS.**

**Walkley, Arthur Bingham (1855–1926), Eng. dramatic critic, b. at Bristol, and educated at Warminster School and Balliol College, Oxford. He was dramatic critic to *The Times* and other papers, being one of the most prominent critics of his day.**

**Walküre, or Walkyries, see VALKYRIES.**

**Wall, see WALLS.**

**Wall, Great, of China, see CHINA.**

**Wallaby, see KANGAROO.**

**Wallace, Alfred Russel (1823–1913), Eng. naturalist, b. at Usk, Monmouthshire, began life as an architect, but interested himself in botany. In 1848 W. and H. W. Bates set out for the Amazon, but separated later. From 1854 to 1862 W. was in the Malay Archipelago; here he estab. the 'Wallace Line,' zoologically separating Lombok and Celebes from Bali and Borneo. His own work and the reading of Malthus's *Essay on Population* (which contained ideas tending towards Darwin's theory) led him to the idea of the 'survival of the**



ittest,' as a correlation of natural selection, and his own formulation of the law that every species originates at the same time and in the same locality as a pre-existing closely allied species. He wrote immediately to Darwin, who, noting the coincidence of views, communicated with Sir C. Lyell and Sir Joseph Hooker. As a result a joint paper was read, containing Darwin's views, to the Linnean Society on July 1, 1858. W.'s *Contributions to the Theory of Natural Selection* appeared in 1870, and contained his views on evolution, differing in certain aspects from Darwin. The Royal Medal in 1868 and the first Darwin Medal, 1890, were presented to him by the Royal Society. He was president of the Entomological Society in 1870-71. In 1889 he received the degree of D.C.L. from Oxford. See life by E. D. Cope, 1891; and J. Marchant, *A. R. Wallace: Letters and Reminiscences*, 1916.

**Wallace, Edgar** (1875-1932), Eng. novelist and playwright, b. in London. Left a destitute orphan, he was saved from the workhouse by a fish porter, who brought him up. He went to a Board school in Peckham and then worked in a rubber factory, on a Grimsby trawler, and as a milk-boy and newspaper-seller. He then joined the army and was in S. Africa during the war of 1899-1902. On leaving the army he decided to turn journalist and returned to S. Africa as war correspondent for Reuter's agency.

His first story was *The Four Just Men* (1905), which he pub. at his own expense. After this, W., with amazing energy, wrote or dictated about 150 novels in the space of twenty years. He found his true *milieu* in the 'thriller,' peculiarly his own creation, which he himself styled 'pirate stories in modern dress.' See life by Margaret Lane (his daughter-in-law), 1938.

**Wallace, Henry Agard** (b. 1888), Amer. politician, b. in Adair Co., Iowa. He studied at Iowa State College. From 1933 he was secretary of agriculture in the Roosevelt administration, and in 1940 became vice-president. Truman (*q.v.*) was elected in his place in 1944, and W. became secretary of commerce. In 1946 he attacked the U.S. gov.'s attitude to Russia, and resigned. He toured the U.S.A. and Europe, publicising his views, and in 1948 stood for the presidency as candidate of his newly-formed Progressive party. He polled only 1,116,379 votes, out of a total of more than 47,000,000. When fighting broke out in Korea in 1950, W. announced his support for United Nations' action there.

**Wallace, Sir Richard** (1818-90), Eng. art connoisseur, b. in London, and educated in Paris, where he gathered together a valuable collection, sold in 1857. He then helped the marquis of Hertford, his half-brother, in forming his collection which he inherited in 1876, and which was bequeathed by his widow to the nation in 1897, and is now housed in Hertford House, Manchester Sq., London.

**Wallace, Sir William** (c. 1272-1305), Scottish patriot, b. probably at Filderslie,

near Paisley. He came of a family of the lesser nobility of Scotland, and first took up arms against the Eng. in 1297. It was an opportune moment for a Scottish rising. Edward I. had taken advantage of the dispute about the succession to the Scottish throne to possess himself of the country. In 1296 he ravaged Scotland and made prisoner John de Baliol, at the time the occupant of the



SIR WILLIAM WALLACE

Throne. John de Warenne was appointed guardian of Scotland, and Eng. sheriffs were set up in the S. shires, and in Ayr, Lanark. In 1297 the Eng. barons and clergy were in revolt against Edward I., while he was absorbed in preparations for the Fr. war. W. seized his opportunity, organised the Scottish insurgents in the name of John de Baliol, killed Sir William Heselrig, the Eng. sheriff of Lanark, and became Guardian of Scotland. He next drove the Eng. out of Perth, Stirling, and Lanark shires, besieged Dundee and Stirling castles, and defeated the Eng. at Stirling Bridge. All this was the work of 1297; but after ravaging Northumberland, Westmorland, and Cumberland, he was defeated by Edward I. at Falkirk (1298) and resigned the Guardianship of Scotland. After this he withdrew to France and solicited aid from Norway, France, and the pope; but being refused, returned to Scotland, and carried on a guerilla warfare (1303-05). He was declared an outlaw by Edward I. (1304), and having been captured by treachery at Glasgow (1305) was brought to London, tried, and executed the same year. See life by J. Ferguson, 1938.

**Wallace Line**, see under WALLACE, ALFRED RUSSELL.

**Wallach, Otto** (1847-1931), Ger. chemist, b. at Königsberg. He was a prof. at Bonn in 1876, and at Göttingen from 1889 to 1915. He worked on camphor and terpenes, and on volatile oils and scents, winning the Nobel prize for chemistry in 1910.

**Wallachia, or Muntenia**, prov. of Rumania, lying between the Carpathians and the Danube, the Black Sea, and Yugoslavia. W. was one of the two Danubian principalities (the other being Moldavia), in the union of which the kingdom of Rumania had its origin under the Treaty of Paris, April 1856. W. is the prin. agric. area of the country. Area 29,960 sq. m. Pop. 6,579,000.

**Wallaroo**, tn. of S. Australia on the E. shore of Flinders Gulf, 85 m. by rail from Adelaide. Its chief industries are now two superphosphate works and a clothing factory. Pop. 3000.

**Wallas, Graham** (1858-1932), Eng. sociologist and political scientist, b. in Sunderland, educated at Shrewsbury School and Corpus Christi College, Oxford.

His most important work on sociology, *Human Nature in Politics*, did not appear until 1908. W. was a lecturer at the London School of Economics, 1895-1914, and prof. of Political Science at London Univ., 1914-23.

**Wallasey**, co. bor. of Cheshire, on the S. side of the estuary of the Mersey, 3 m. N.W. of Birkenhead. It developed as a residential suburb of Liverpool and Birkenhead, and became a co. bor. in 1913. Under the Town Planning Act, 1947, a start was made on the detailed planning of the Moreton and Leasowe areas to provide facilities for community needs of an ultimate pop. of 34,000 there. W. has many fine parks and pleasure grounds. The Ferry Undertaking has been publicly owned for over 85 years and annually an average of some 20 million passengers are carried across the Mersey. W. has a fine tn. hall. There are five grammar schools, the oldest, W. grammar school (for boys), was founded in the sixteenth century. Leasowe, Moreton, and Saughall Massie are modern residential suburbs. Pop. 100,000.

**Walla Walla**, co. seat of W. W. co., Washington, U.S.A., on Mile Creek. It is the centre of an important wheat-growing dist., and has flour mills, and meat-packing factories. It is an educational centre. Pop. 18,100.

**Wallenstein, or Walstein, Albrecht Wenzel Eusebius von** (1583-1634), Ger. soldier, duke of Friedland, b. in Bohemia. His father was a Protestant, but he early determined to embrace the Catholic faith. He took part in the war between the archduke Ferdinand and the Venetians. On the outbreak of the Bohemian revolt he obtained the command of an army, defeated Mansfeld (*q.v.*), and conquered a great stretch of country. He was created duke of Mecklenburg by the emperor. In 1632 he was defeated at Lützen by Gustavus Adolphus. The Emperor decided that W. had become too powerful for Hapsburg safety. He was charged with treachery, and murdered. See

lives by L. von Ranke, 1910; H. von Srbic, 1920; and W. Tritsch, 1936. See also C. V. Wedgwood, *The Thirty Years War*, 1944.

**Waller, Edmund** (1606-87), Eng. poet and politician, b. at Coleshill, Bucks. He was a student of Lincoln's Inn in 1622, and four years later was M.P. for High Wycombe, and for Amersham in 1628 and 1640. In this latter year he sat in the Long Parliament. He was at heart a royalist, and having been caught plotting to seize London for Charles I., was arrested and expelled from the House (1643). He was a prisoner in the Tower (1643-44), but his sentence of death was commuted to a heavy fine and banishment. He was, however, pardoned in 1651 by Cromwell's influence, and pub. laudatory verses upon him in 1655. But he also wrote poems of rejoicing on Cromwell's death (1658), and in 1660 pub. *To the King, upon his Majesty's Happy Return*. His *Divine Poems* appeared in 1685. He is chiefly known for the lyrics he wrote to the lady he called Sacharissa, identified with Lady Dorothy Sidney.

**Wallflower** (*Cheiranthus cheiri*), fragrant cruciferous perennial plant, a number of beautiful varieties of which are grown in gardens, bearing yellow, brown, red, and variegated flowers. They are usually treated as biennials, the seed being sown in May.

**Wallingford**: 1. Municipal bor. of Berks, England, on the r. b. of the Thames, about 48 m. by road from London. It is a mkt. tn. and centre for an agric. dist. It is the site of a Rom. camp, and is mentioned in the Domesday Book. Pop. 3600. 2. Tn. in New Haven co., Connecticut, U.S.A., with silver-plate works and manufs. of buttons, britannia and brass ware. There are insulated wire factories and steel mills. Agriculture and fruit-growing are carried on in the dist. Pop. 11,400.

**Wallington**, par. of Surrey, Eng., 2 m. W. of Croydon, formerly noted for its cultivation of lavender. It forms with Beddington a single municipal bor. with a pop. of 35,000.

**Wallis, John** (1616-1703), Eng. mathematician, b. at Ashford, Kent, was Savilian professor of geometry at Oxford, 1649-1703, and keeper of the archives, 1658-1703. He introduced the principles of analogy and continuity into mathematical science, and widened the range of the higher algebra. He pub. *Arithmetica Infinitorum* (1655), which contained the germs of the differential calculus, and invented the symbol  $\infty$  for infinity.

**Wallis, see VALAIS.**

**Walloons**, inhab. of S. and S.E. Belgium (Wallonie) and of the Fr. départements Ardennes, Aisne, and Nord. They speak different varieties of a romance dialect (see under ROMANCE LANGUAGES), which contains also some Celtic roots and many words of Flemish origin. Walloon is commonly, but not quite accurately, considered as 'Belgian French'; indeed, the origin and the development of Walloon is in many ways parallel with those of mod. Fr. (the Walloon part of Belgium

was occupied by Rom. forces for centuries). In contrast to Fr. the vowels are pronounced less distinctly. Final syllables are omitted very often and all W. dialects show the characteristic singling accent. From the twelfth till the fifteenth century sev. chronicles were composed in the Walloon dialect. In the seventeenth century it is found again in literary works. From that time on a W. literature has existed; it is regional but very lively. The people are generally dark, short set, and as a rule they differ in character from their Flemish fellow-countrymen. The W. of Belgium are strongly attached to France by ties of a cultural nature (Fr. is the cultivated language of the W.). Among them the most fervent promoters of a federal Belgium are to be found. For many years there has been friction between the W. and the Flemings (Ypres, Courtrai, Brussels, and Liège may be considered as situated on the 'border line' between the W. and the Flemings). Both in the First and in the Second World Wars the W. accused the Flemings of disloyalty to the Belgian state. Between the two wars the Flemings were successful in securing official recognition for the Flemish tongue. In 1950 King Leopold's restoration for a brief period led to a secessionist campaign by the W., and the threat of civil war; and the king was forced to retire in favour of his son, Prince Baudouin, who was to be crowned king on reaching his majority (1951). See J. Destree, *Wallonie*, 1914; M. Vankhoff, *Philologie et littérature wallonnes*, 1938; M. Piron, *Les lettres wallonnes contemporaines*, 1944; E. Baudart, *L'avenir de la Wallonie*, 1945; and L. Renècle, *Le Problème de l'ancien Wallon*, 1948.

**Wall Pellitory**, see PELLITORY OF THE WALL.

**Wall Pennywort**, see under COTYLEDON.  
**Walls.** The most common types of W. in Great Britain are the external and internal wall to the usual small house. The external wall is usually of 9 in. brick (one brick thick) and it performs two main functions: it acts as a screen to the weather, and it supports the upper floor and the roof. The wall is often built in two half-brick slices with a 2 in. cavity between them, and is then known as an 11 in. cavity wall. This form, once used mainly in exposed dists., is now used on a large scale in house-building. The two slices are bonded together by wall ties, usually of twisted or indented metal to prevent moisture creeping across the cavity. The inside of the wall is usually covered with  $\frac{1}{2}$  in. of plaster to give a smooth finish, though in recent years many have been lined with boards, usually of wood fibre or plaster.

The external W. minimise the passage of sound and heat, and there is an increasing tendency to use special insulating materials to prevent the escape of heat and thus cut down fuel costs. The internal W. to small houses are usually half-brick thick or timber studding faced on both sides with plaster, or wood-fibre or plaster boards. For other buildings, such as schools, blocks of flats

or industrial buildings, the W. are thicker, 13 $\frac{1}{2}$  in., or 18 in., etc., often decreasing in thickness by  $\frac{1}{2}$  in. reductions as the wall rises. But the increasing tendency is to build W. of large buildings on the frame and panel method; that is, a frame of steel or reinforced concrete is first erected, and the panels (or voids between the members of the frame) filled in with brickwork, concrete, or stonework. The frame thus supports the building and loads, and the panels act as a screen against the weather and passage of heat and noise. Although stress has been laid here on brick construction, in some dists., as in the Cotswolds, stone is the usual walling material, and in other places concrete is largely used. The concrete is either laid *in situ*, by pouring it between two sheets of shuttering, or is pre-cast in the form of blocks and laid like masonry. Other materials have been largely used for the W. of prefabricated houses. Thousands of the latter have been built of asbestos-cement sheets along with special insulation of various kinds, or of two sheets of resin-bonded plywood stuffed between with slag wool, or even of insulated steel or aluminium sheets. Finally, some building technicians look forward to the day when house W. and panels will be cut from a continuous composite sheet issuing from a large machine, this sheet having a durable outer face, to withstand the weather, a porous inner face to absorb moisture, adequate calculated strength, and of appropriate insulation values to heat, and sound. In comparison with W. of ant. times, modern W., particularly for large buildings, are scientifically designed; they have, for a minimum amount of material, a calculated strength, heat, and sound insulation, etc. Old W. were built by rule-of-thumb methods, were often of massive thickness, and sometimes used for military defence, both in buildings and to protect ins. and cities. These are often of great beauty, especially the red brick W. of Eng. country houses and parks.

Wooden W. are roughly of three types: (1) solid W. built of logs or planks; (2) upright studs to which weatherboards are nailed; (3) stressed-skin W. consisting of two sheets of plywood rigidly fixed by resin glues to strips between the sheets. In such a stressed-skin wall, when it is bent, e.g. by the wind, the outer sheet resists compression while the inner one resists the tension.

**Wallsend:** 1. Tn. and mun. bor. of Northumberland, England, situated on the Tyne. Its name is taken from its position at the E. end of Hadrian's Wall (q.v.). Its chief industries are coal-mining, shipbuilding, engineering, metal smelting and manufs., and chemicals. Pop. 48,800. 2. Tn. of New S. Wales, Australia, 13 m. from Newcastle, a colliery centre. Pop. 5000.

**Wall Street**, street of New York, the financial centre. It is a narrow thoroughfare seven blocks long which runs from Trinity Church in Broadway to the East R. In Wall Street and the thoroughfares

in the immediate proximity are located most of the great banks, trust companies, insurance corporations, as well as the head offices of the big railway, steamship, metal, and coal companies. In this dist. are also located the Stock, Coffee, Cotton, Metal, Produce, and Corn Exchanges.

**Walmer**, tn. and seaside resort on the coast of Kent, England. Since 1935 amalgamated with the bor. of Deal, it is one of the reputed landing-places of Julius Cæsar. Walmer Castle, residence of the Lord Warden of the Cinque Ports, was built by Henry VIII. in 1539 as one of a series of forts for the defence of the S.E. coast against artillery assaults.

**Walnut** (*Juglans regia*), tree of the family Juglandaceæ; the Eng. variety, the Persian W., is hardly though not a native. Other varieties are found in the Far E., and the Black W. in America, the latter forming the bulk of supplies in Britain. Besides its nuts, which are of much value as a dessert delicacy, the wood is in great demand by cabinet-makers; burred wood, chiefly obtained from Mediterranean countries, is valuable for veneers. Sugar has been made from the sap, and the aromatic leaves have been used in pharmacy.

**Walpole**, **Horace**, fourth Earl of Orford (1717-97), Eng. author and letter-writer, *b.* in London, the youngest son of Robert W., the Eng. statesman. At the age of twenty-two he visited France and Italy, together with the poet Gray. Whilst on the tour he met Horace Mann, with whom he maintained a correspondence for some very considerable period, and in France formed a friendship with Madame du Defand. He returned to England, having quarrelled with Gray, and entered Parliament, holding a seat continuously up to 1768. It is, however, not as a politician but as an author that he is famous. His memoirs and correspondence are of the greatest importance to students of the life and times of the middle eighteenth century. He lived at Strawberry Hill, Twickenham, from 1747. This he converted into 'a little Gothic castle' and his house became the centre of fashionable learning in England. He set up a printing press there and published much that was his own and his friends Gray's *Odes* were issued from here, as was his own *Castle of Otranto* (1765), published under a pseudonym and as a 'Gothic romance' from the It. This established the vogue of the 'terror novel.' His memoirs include: *Reminiscences* (1805); *Memoirs of the last Ten Years of the Reign of George II.* (1822); and *Journal of 1771-83* (1859). He also wrote a tragedy, essays, prologues, and many *jeux d'esprit* in prose and verse; but his greatest work was his *Letters*. In style these show something of the polish and refinement of Madame de Sévigné and the epigrammatic felicity of Voltaire.

The *Letters* of W. were collected and arranged by Mrs. Paget Toynbee (1903-5), and by W. S. Lewis (1931 ff.), and his *Works* ed. by Mary Berry and others (1798-1825). See lives and studies by L. B. Seeley, 1884; A. Dobson, 1890;

P. Yvon, 1924; D. M. Stuart, 1927; L. Melville, 1930; S. Gwynn, 1932; R. W. Ketton-Cramer, 1946. See also *Walpole's Letters to Sir Horace Mann* (review and essay by Lord Macaulay), 1883; W. S. Lewis\* (ed.) *Horace Walpole's Fugitive Verses*, 1931; and A. T. Hazen, *Bibliography of the Strawberry Hill Press*, 1942.

**Walpole**, **Sir Hugh Seymour** (1884-1941), Eng. novelist, *b.* in New Zealand, son of George W., bishop of Edinburgh, and educated at King's School, Canterbury, Bede College, Durham, and Emmanuel College, Cambridge. He wrote with much distinction on the cathedral city environment, and *The Cathedral* (1922) is his finest work in this particular sphere. His first novel, *The Wooden Horse*, appeared in 1909, and W. established himself in Chelsea as a writer. His next three novels were produced in fairly rapid succession, *Maradick at Forty* (1910), *Mr. Perrin and Mr. Trill* (1911), and *Prelude to Adventure* (1912), the second of these, a study of school life, attracting much attention. But his first big success was *Fortitude*. His experiences in Russia during the First World War suggested his *The Duchess of Wrece* (1914), a penetrating study of an autocratic personality symbolic of a social system in decay; *The Dark Forest* (1916); and *The Secret City* (1919) for which he was awarded the James Tait Black Prize.

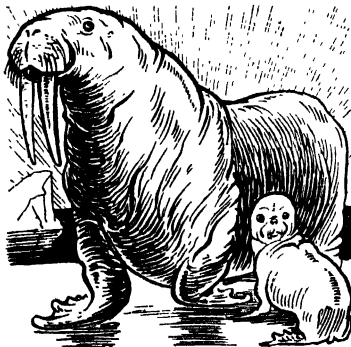
W.'s later writing is dominated, however, by that massive and gorgeously tapestried historical work, the tetralogy of *Rogue Herries* (1930), *Judith Paris* (1931), *The Fortress* (1932), and *Vanessa* (1933), which form his 'Lakeland saga,' a most sustained product of the modern romantic revival and one which endowed historical fiction with a new life. See study by Marguerite Steen, 1933.

**Walpole**, **Sir Robert** first Earl of Orford (1676-1745), Eng. statesman, *b.* at Houghton in Norfolk. He studied at King's College, Cambridge. A Whig by persuasion and upbringing, he entered Parliament in 1701 as M.P. for Castle Rising, and in the next Parliament, the first of the reign of Queen Anne, for Lynn. He quickly distinguished himself, and in 1708 he became secretary for war. On the accession of the Tories in 1710 he was accused of peculation, and was dismissed his office and sent to the Tower. The Protestant succession, however, restored him to favour, and in 1715 he became chancellor of the exchequer, and practically George I.'s chief minister. On the dismissal of Townshend he resigned and opposed strongly the policy of Stanhope and Sunderland. His greatest victory in opposition was the rejection in 1718 of the Poerage Bill, which limited the prerogative of the crown and which would have increased enormously the power of the House of Lords. The mania for speculation culminated in 1721 in the South Sea Bubble, public credit was at a discount, and the country seemed to be on the verge of ruin. But W. made these ruins stepping stones to success. He became the chief minister.

The position which he occupied and the doctrine of ministerial cohesion which he held, are generally considered to justify his being regarded as the first effective Eng. Prime Minister. As a financial minister few men have equalled him. He had no high ideals, but was actuated throughout by motives of strong common sense. In 1739 the war of 'Jenkins's Ear' was declared, and W. ought to have resigned, since he had declared war much against his will, but he clung to office, and only resigned when his majority had dwindled to two. He was raised to the peerage as Earl of Orford. *See* lives by W. Coke, 1798-1800; A. C. Ewald, 1878; and Lord Morley, new ed., 1921; *see also* J. M. Robertson, *Bolingbroke and Walpole*, 1919; F. S. Oliver, *The Endless Adventure*, 1930-1; and G. R. Stirling-Taylor, *Robert Walpole and his Age*, 1931. *See also* L. B. Namier, *The Structure of Politics at the Accession of George III.*, 1929.

**Walpurga, St. (Walpurgis or Walburga)** (d. c. 779), sister of SS. Willibald and Winebald. She became a nun at Wimborne, Dorset, and at the invitation of St. Boniface followed St. Lioba to Germany, becoming abbess of Heidenheim until her death. Her relics were transferred to Eichstätt, where a convent was erected in her honour. Throughout all Germany, and even in France, the Netherlands, and England, churches and chapels were dedicated to her. The feast of W. falls properly on Feb. 25, but in some Ger. calendars it is assigned to May 1, which day, with its promise of returning summer, was already associated with various heathen celebrations, from which the ann. Witches' Sabbath on Walpurgis-Night took form. (*See* Goethe's *Faust*.) St. W. is also regarded as having the power to ward off magic influences.

**Walrus, Sea Horse, Sea Cow, or Morse** (*Odobenus*), large marine carnivore. The Pacific W. (*O. obscurus*) occurs around



WALRUS

Alaska and the N.E. Siberian coasts. The Atlantic W. (*O. rosmarus*) is found in Spitzbergen and other European is. of the far N. The W. has been ruthlessly

hunted for its immense tusk-like upper canines, its hide, and its oil. It is a gregarious animal, and quiet and inoffensive in disposition except during the breeding season, or if attacked, when it is capable of fighting fiercely. It averages 10 to 12 ft. in length, though specimens nearly twice as long are recorded. The muzzle is divided between the nostrils, and bears bristly moustaches. The eyes are small, and there is no external ear. The adult animal has only one incisor and three premolar teeth at each side of the upper jaw besides the tusks; in the lower jaw only three premolars and one small canine occur on each side. Bivalve molluscs are its prin. diet.

**Walsall**, mkt. tn., co. and municipal bor. of Staffordshire, England, 8 m. N.W. of Birmingham. Queen Mary's school was estab. in 1534. It has trade in harness, saddlery, and leather goods as well as in engineering and hardware. Pop. 104,500.

**Walsingham, Sir Francis** (c. 1530-90), Eng. statesman, b. at Cluselhurst, Kent, and educated at King's College, Cambridge. He travelled widely in Europe, but on the accession of Elizabeth returned to England, and in 1569 acted as chief of the secret service in London. He was secretary of state from 1573 until 1590. He secured the conviction of Wm. Parry, 1585, Anthony Babington, 1586, and Mary, Queen of Scots, 1586.

W.'s whole administration of foreign affairs was founded on a system of espionage and bribes, but his diplomatic methods were balanced by an undoubted personal integrity and disinterested patriotism. *See* C. Read, *Mr. Secretary Walsingham and the Policy of Queen Elizabeth*, 1925.

**Walsingham, Thomas** (d. c. 1422), Eng. monk and historian, was preceptor and superintendent of the scriptorium of St. Albans Abbey, and afterwards prior of Wymondham. He is the prin. authority for the reigns of Richard II., Henry IV., and Henry V. He compiled parts of *Historia Anglicana 1272-1422* (ed. H. T. Riley, 2 vols. in Rolls series, 1863; *Chronicon Anglie* (1328-88); *Ypodigma Neustrie*, a record of events in Normandy; and *Gesta Abbatum*.

**Walsingham**, tn. in Norfolk, England, with the ruins of an Augustinian priory (twelfth century); a shrine of the Virgin much visited by medieval pilgrims. There are modern Anglican and Rom. Catholic shrines. Pop. of rural dist. 17,000.

**Walter, Bruno** (b. 1876), name adopted by B. W. Schlesinger, Ger. conductor and composer, b. in Berlin. He graduated at the Stern Conservatory, Berlin, and spent his early years as conductor in the opera houses in various Ger. cities. He was much influenced by Mahler, whom he accompanied to Vienna in 1901. He remained there as assistant conductor at the Hofoper until 1913 when he went to Munich as Music Director. By the time he resigned that post in 1922 he had estab. a European reputation as a great interpretative conductor of opera—and of

Mozart in particular. In that year he took part in the Salzburg Festival with which he was associated for many years. He conducted in Berlin and Leipzig until 1933 when on his dismissal by the Nazis he went as conductor to the State Opera in Vienna. After the Ger. annexation of Austria he became a Fr. citizen, and has since conducted mainly in New York but also in France, Italy, and Great Britain.

**Walter, Hubert** (d. 1205), Eng. cleric and administrator, b. probably at W. Dereham, Norfolk. W. may have been trained in Glanvill's household : after a series of rapid civil and eccles. promotions he became in 1193, archbishop of Canterbury and justiciar. Some historians suggest that *Tractatus de Legibus et Consuetudinibus Anglie*, commonly attributed to Glanvill, was in fact compiled under W.'s direction.

**Walter, John**, name of three successive proprietors of *The Times* (q.v.) newspaper : (1) (1739-1812) founder and first editor, son of a London coal-merchant, whose business he followed prosperously till 1781. He was also an underwriter till 1782. He set up a printing business in Printing-House Square, 1784, and printed, Jan. 1, 1785, the first number of *Daily Universal Register*, which was renamed *The Times*, Jan. 1, 1788. (2) (1776-1847), chief proprietor ; b. probably at Battersea, second son of the founder. Educated at Merchant Taylors' School and Trinity College, Oxford, he succeeded his elder brother as manager, 1803, and was editor till c. 1810. (3) (1818-94) chief proprietor, b. at Printing-House Square, eldest son of the last-named. Educated at Eton and Exeter College, Oxford, he was called to the Bar at Lincoln's Inn, 1847. He became sole manager on his father's death.

**Walters, Lucy** (c. 1630-58), daughter of a S. Wales squire, and mistress or wife of Charles II. She went to the Hague, where she became the mistress of the exiled prince of Wales (later Charles II.) in 1648. At Rotterdam on Apr. 9, 1649, she bore Charles a son, James, whom he created duke of Monmouth. See Lord George Scott, *Lucy Walters, Wife or Mistress?*, 1948.

**Waltham**, city of Middlesex co., Massachusetts, U.S.A. It has the Amer. Waltham Watch Company, the largest watch factory in the world, and numerous cotton mills, the first one in America being estab. here in about 1814. W. manufs. also aircraft, motor vehicles, bicycles, brass and iron ware, and organs. Pop. 40,000.

**Waltham, Waltham Abbey, or Waltham Holy Cross**, anct. mkt. tn. on the H. Lea, 12½ m. from London and an urban dist. of Essex. It is now famous chiefly for its important anct. abbey church. The church of Holy Cross was founded in 1060, on an earlier foundation, by King Harold ; Henry II. converted it into a priory, and, in 1184, it became an abbey. There are manufs. of plastics and chemicals, and horticultural and scientific research estabs. Pop. 6900.

**Walthamstow**, residential and industrial suburb in the metropolitan area of Essex, on the l. b. of the Lea. It includes 300 acs. of Epping Forest. Wm. Morris was b. in W. A civic centre was opened in 1941. There are plastic and light engineering industries, etc. W. has two members of Parliament. Pop. 123,400.

**Waltham Cross**, dist. of Hertfordshire, part of the urban dist. of Cheshunt, about 13 m. from London. Here is one of the crosses erected by Edward I. to commemorate the resting stages of the body of Queen Eleanor on its way to Westminster Abbey.

**Walther von der Vogelweide** (c. 1170-c. 1230), Ger. minnesinger, probably a native of Tyrol. The greatest of Ger. medieval poets, his mastery lay in wealth of tone and feeling and choice of language. His poems have been frequently ed., and there are Eng. trans. of some by W. A. Phillips (1896). See studies by A. E. Schonbach, 1890, 1924 ; C. Bützler, 1940.

**Walton, Izaak** (1593-1683), Eng. author, b. at Stafford. He was apprenticed to an ironmonger in London, and by 1614 was in possession of a business of his own. He had before 1619 begun to write verses, and in 1640 he prefixed a life of Donne to the first folio ed. of that author's *Sermons*, which was much approved by John Hales. He afterwards issued separately an improved ed. of his *Life of Donne* (1658). In 1651 he pub. *Reliquiae Wottonianae* with his *Life of Sir Henry Wotton*, and two years later produced his famous treatise *The Compleat Angler, or the Contemplative Man's Recreation*. In 1665 he pub. his *Life of Richard Hooker*, and in 1670 appeared his *Life of George Herbert*, followed in 1678 by that of *Bishop Sanderson*. C. Cotton's dialogue between Piscator and Viator was pub. as a second part in the fifth ed. of *The Compleat Angler*. See complete ed. of works ed. by G. I. Keynes, 1929.

**Walton, William Turner** (b. 1902), Eng. composer, b. at Oldham, Lancs. He won a probationership at Christ Church Cathedral Choir School, Oxford, at the age of ten, and became an undergraduate of Christ Church at sixteen. He studied at first under Sir Hugh Allen and E. J. Dent, and latterly by himself. In 1923 he became known as the composer of a string quartet (1922) which was performed at the Salzburg Festival ; and of *Façade* (1923), to accompany a series of poems by Edith Sitwell, performed at Aeolian Hall, June 12. In 1929 his competent viola concerto appeared, and when the striking choral work, *Beshazzar's Feast*, was given in 1931 he definitely came to the notice of the general public. The appearance of his *Sinfonia Concertante* in 1927 estab. his fame. Of greater significance, however, was his *Symphony*, first performed (without the finale) in 1934. Other works include : Quartet for pianoforte and strings (1918) ; *The Passionate Shepherd*, for tenor and small orchestra (1920) ; *Toccata*, violin and pianoforte (1921-22) ; *Portsmouth Point*, overture (1925) (per-

formed at the Zürich Festival, 1926); *Siesta* for small orchestra (1926); *Crown Imperial* (Coronation March) (1937); *Violin Concerto* (1939); *Seapero* (comedy overture) (1940); *Hamlet* (film) (1947).

**Walton-le-Dale**, urb. dist. of N.E. Lancashire, England, on the Ribble; it has cotton mills, corn mills, and iron foundries. The Unicorn Inn was Cromwell's headquarters in 1648. Pop. 14,600.

**Walton-on-Thames**, urb. dist. and tn. of Surrey, England, a favourite resort for boating and angling, and a residential suburb of London. Pop. 18,000.

**Walton-on-the-Naze**, or **Walton-le-Soken**, urb. dist. (with Frinton), and par. of N.E. Essex, England, 7 m. S. of Harwich; it is a favourite seaside resort. Pop. 3200.

**Waltz**, ballroom dance coming into fashion towards the end of the eighteenth century and probably derived from the old Ger. *Ländler* (or *Schleifer*). Beethoven, Weber, and Schubert were among the first masters to cultivate it seriously and the elder J. Strauss and Lanner among the first ballroom composers to develop its vogue in Vienna, whence it rapidly spread all over Europe. It is in 3-4 time, varying in pace at different times and in different countries. As a medium for instrumental music it was used by Chopin, Brahms, and others. See M. Carner, *The Waltz*, 1948.

**Walvis (Walvis) Bay**, bay on the W. coast of Africa. Most of the imports of S.W. Africa are landed at W. B., the only good harbour on that coast. It is the principal seaboard terminus of the S.W. Africa railway. It has a wireless station. Administratively it is included in the S.W. Africa Protectorate (since 1922). Area 374 sq. m. Pop. 2030.

**Wampum**, Amer. Indian name for perforated shell beads, woven into articles of personal adornment, and used in many forms as a medium of exchange of goods and property, i.e. as currency. The W. was also employed for sealing treaties and as means of recording important events; it thus became a symbolic device for communications, i.e. a sort of writing. Broad belts or collars were formed of strings of W. arranged in patterns, sometimes representing pictographs, according to the story to be recorded. The most famous W. is the 'Penn Treaty' preserved by the Historical Society of Pennsylvania. This W. records the treaty between Penn and the Leni-Lenape at Shackamaxon on the Delaware R. in 1682.

**Wandering Jew, The**, see JEW, THE WANDERING.

**Wandewash**, tn. of Madras prov., India, in N. Arcot dist. It was the scene of the decisive victory by Eyre Coote over the Fr. on Jan. 22, 1760, by which Brit. ascendancy was virtually assured.

**Wandsworth**, metropolitan and parl. bor. (returning four members), and par. in the co. of London, England, named after the R. Wandle on which it stands. It is the largest of the metropolitan bors. (9108 ac.) and includes the pars. of Putney, Clapham (part), Streatham,

Balham, and Tooting. It has a fine common of 183 ac. and a park of 20 ac. There is a Huguenot burial ground at East Hill. The Wandsworth Prison dates from 1851. The industries include oil-mills, dye works, paper mills, calico-printing, and breweries. Pop. 264,000.

**Wanganui**, city and port, on the W. coast of N. Is. New Zealand, on the Wanganui R., 134 m. N. of Wellington by rail. It is the depot and port for a large area of pastoral and agric. country. The chief industries are freezing works, engineering works, woollen mills, steel pipe works, fertiliser, and chemical works. The magnificent scenery of the upper riv. attracts many overseas tourists and holiday makers from other parts of New Zealand. Pop. 26,000.

**Wangaratta**, tn. of Victoria, Australia, 130 m. N.E. of Melbourne, at the junction of the Ovens and King Rs., and the cos. of Bogong, Delatite, and Moira. It is the centre of an agric. dist. producing hops, tobacco, and broom. There are woollen mills and a rayon factory. Pop. 6,700.

**Wanstead and Woodford**, bor. of Essex, England, situated on the outskirts of Greater London and bounded by Epping Forest. It is predominately residential in character and has a pop. of 62,000 (estimated 1950). With the urb. dist. of Chingwell it forms the parl. bor. of Woodford.

**Wantage**, mrkt. tn. of Berkshire, England, 25 m. N.W. of Reading. It is famous as the b. p. of Alfred the Great. There is trade in agric. produce. Pop. 5300.

**Wapenshaw** (A.-S. *waepen*, weapon; *scæwan*, to show), in Scots feudal history, an exhibition of arms, according to the rank of the individual, made formerly at certain times in every dist. Such exhibitions or meetings were not designed for military exercises, but with the object of showing that the lieges were properly provided with arms. The name has also been used to denote the periodical meetings of volunteer corps.

**Wapentake** (Old Norse *wápnatak*, touching of weapons), div. of those Eng. cos. which were settled by the Danes, corresponding to the 'hundred' (q.v.) elsewhere.

**Wapiti** (*Cervus canadensis*), large and magnificent deer once widely distributed throughout N. America, now limited to the Rockies and the Cascades. It is also found in N.E. and Central Asia.

**Wapping**, dist. of London, on the N. bank of the Thames, in the metropolitan bor. of Stepney. The Thames tunnel goes from W. to Rotherhithe. The Old Stairs of Dibdin's ballad are near the High St. The London Docks are here.

**War and Warfare**. War may be defined as 'the state or condition of governments contending by force' (Westlake), and in ascertaining whether such a state or condition exists, the intention of the parties or either of them must be regarded. The mere commission of certain acts of force, hostility, or unfriendliness is not sufficient, there being, for instance, certain acts warlike in their essence but

traditionally held to fall short of war, to which a nation may resort when provoked under circumstances of too little moment to call for a declaration of war. It is always open to the Power affected by such acts to treat their commission as an act of war, but if it does not elect to do so, the peace is deemed to remain unbroken. The most familiar among these acts of forcible redress short of war are retorsions (*q.v.*), reprisals (*q.v.*), and pacific blockade (*i.e.*, a blockade that leaves third Powers free to enter and leave the blockaded ports at pleasure). For a considerable time it was held, though not unanimously, to be necessary that the outbreak of war should be preceded by a solemn declaration. This theory was very frequently disregarded in practice, there being either no declaration at all, or a declaration at some date after the first act of hostility. It became, however, customary in the latter part of the nineteenth century to issue a manifesto announcing the outbreak of war and present practice is founded on the third Hague Convention drawn up at the Peace Conference in 1907, the Powers recognising 'that hostilities between them must not commence without a previous and explicit warning in the form of either a declaration of war, giving reasons, or an ultimatum with a conditional declaration of war.' A war may be brought to an end in three ways: (1) by the reciprocal intermission of hostilities without any definite understanding being arrived at between the belligerents. (2) By the conquest and subjugation of one of the belligerents by the other. (3) By a bilateral arrangement embodied in a treaty of peace, whether the honours of war be equal or unequal.

For warfare see (*inter alia*) **AERIAL WARFARE**; **ARMS**; **ARMY**; **BELLIGERENTS**; **RIGHTS AND DUTIES OF**; **BLOCKADE**; **CHEMICAL WARFARE**; **CRIMES**; **WAR**; **PRISONERS OF WAR**; **RED CROSS**; **NAVY AND NAVIES**; **STRATEGY AND TACTICS**; Various wars, historic battles, and weapons of war, are treated in separate articles.

**War, Civil**, armed conflict between opposing groups of the same nationality within the same country. Foreign examples include the Amer. Civil war (1861-65), the Sp. Civil war (1936-39), and the Chinese Civil war (1928- unfinished).

In England, the term is specifically appropriated to the Eng. Civil war, 1642-49. This falls into two divs.: (1) from 1642 until the Royalist defeat at Naseby, 1645; (2) from Charles I.'s 'engagement' with the Scots in 1647 until his execution in 1649. From 1650 until 1651 fighting again flared up, but it ended after Cromwell's victory at Worcester.

**The First Civil War.**—The basic causes of the war were deep-rooted. Modern parl. power began when Henry VIII. used Parliament to ratify his religious changes. Under James, the conflict between Crown and Commons developed and a definite opposition party emerged. In the closing years of Elizabeth's reign, the growing fissures in the Tudor constitutional fabric

were hidden by the influence of the queen's personality. The ambiguous character of Elizabeth's religious 'settlement' meant that a final religious settlement was merely postponed. Calvinism grew during her reign. It permeated the two classes which had received substantial material and political benefits from the Reformation and from the expansion in colonial enterprise and trade during the sixteenth century, namely, a section of the squirearchy and most of the large merchants. It was these classes who returned and were returned as members of Parliament; and their power was increased by the rise in prices throughout the sixteenth century, which benefited them more than the Crown, whose revenue was largely fixed.

Poor Stuart statesmanship bared these problems and added to them. James's extravagance and leanings towards the unpopular Arminians angered an already difficult Parliament. His lack of tact in the dispensing of patronage lost him the support of essential interests. Charles I. increased the Crown's unpopularity by ardently supporting Arminianism, and by his foolish choice of favourites. His instability hampered the work of his best servants, like Strafford, and set a critical Commons almost continuously on the offensive against him. The Commons (1603-42) underestimated the expenses of the gov., and represented a religious opinion, which, in its positive form, was far from universal, but the clumsiness of the monarchy incited them to press their criticisms and demands to extremes, and gave them a following among the mob.

The Scottish wars precipitated the conflict, forcing Charles to summon Parliament, after eleven years of apparently successful 'personal rule' to obtain essential supplies. The over-confidence of the Puritan parliamentarians who returned to Westminster in 1641 led them to excesses in religious and political views which did much to cause the creation of a Royalist party, and to occasion the fighting. Parliament was agreed on many subjects. Between Feb. and Aug. 1641, the King agreed to a series of limitations on his powers, such as the abolition of the Star Chamber. But the debates on the 'root and branch' (*see* **ROOT AND BRANCH MEN**) petition of Dec. 1640, showed that an unreserved religious div. existed. A strong minority emerged which, though anti-Arminian, was not prepared to sacrifice the episcopal structure and the Book of Common Prayer (*see* **ROYALISTS**). When in Feb. 1642, Charles left Whitehall for York, many moderates joined him, and the Puritan extremists in the Commons gained the upper hand. Parliament demanded control of the militia and Charles refused.

War was at this stage virtually inevitable. The main strength of both parties at the outset was drawn fairly equally from the upper and middle classes. Their fighting men held, in the main, only slightly different views on the fundamentals of politics and religion, and though sev. historians have variously



tried to base the party div. on geographical, economical, religious, or constitutional issues, the decisive factor in influencing many men's choice in favour of Royalism, would seem to have been their concept of loyalty so well expressed by Sir Edmund Verney (*see under* ROYALISTS), and the poet Lovelace. Though some Puritans (*q.v.*) were actuated by religious motives and others by constitutional beliefs (as in the case of Ralph Verney), many people were attracted to this party by economic or political grudges. This diversity of interest made the original Puritan party divide so rapidly in victory. Its cohesion was largely based on destructive motives. Parliament, however, controlled London and most of the ports, and soon gained control of the navy. At first Charles could rely on generous gifts of jewellery and plate from his nobles and squires to finance his army, but in the long run the wealth of London was to tell against him. Even so, had the king possessed a general of Cromwell's calibre he might have won the war.

*Military Significance of the wars.*—England in 1642 did not support a large professional military class, though in theory a large militia force existed. At first the Royalist cavalry was superior, and the Royalist infantry inferior, to that of the Parliament. A majority of the rural gentry were for the king, and horsemanship was still the accomplishment *par excellence*. The Parliament foot contained from the outset a high proportion of the only efficient element of the militia, the urb. Trained Bands (*q.v.*). Here the question of arms was more decisive. Muskets and pikes had to be bought largely abroad, and here Parliament's financial and naval resources were telling. As the war went on, the training and equipment of the king's infantry improved, but not so fast as that of the Parliament's cavalry. On both sides there was a professional element of officers who had seen foreign service. Cavalry became the dominant arm, and once the royalists had lost their superiority in this connection they lost the war. The great military development of the Civil war was the estab. of the New Model Army (*q.v.*) which contained the germ of a general staff and a permanent system of transport and supply.

*Campaigns (1642-45).*—In July 1642 the Commons resolved to recruit an army and in Aug. the royal standard was raised at Nottingham. An indecisive battle was fought at Edge Hill on Oct. 23. The king estab. his headquarters at Oxford. In Nov. he moved against London, retreating in face of the large forces assembled at Turnham Green. Charles was provided with a well-conceived plan for the 1643 campaign. The earl of Newcastle from the N., and Hopton and Prince Maurice from the W. were to converge on Oxford and unite with the king's own force to attack London. In Lincolnshire, Newcastle's officers refused to advance further against the strong opposition of the E. Association troops under Cromwell, while

Hull lay in parl. hands in their rear. In Sept. parl. forces gained a victory at Winceby (where, in Cromwell's words, his soldiers charged 'singing psalms'), re-occupied Lincolnshire, and relieved Hull. In the S.W. Hopton over-ran Devon, Dorset, and Wiltshire, and reached Sussex by Dec. But his Cornish forces refused to leave Plymouth in parl. hands in their rear and Hopton retreated. Rupert took Bristol in July, but the Welsh border royalists refused to advance on London while Gloucester held out for Parliament, and Charles was forced to besiege it. He raised the siege when a force under Essex marched to relieve the city. Charles's force then blocked the route back to London, at Newbury, where it was attacked on Sept. 20. Shortage of powder compelled a royalist retirement and Essex's forces reached London. By Oct. 1643 the balance had tilted against Charles. His plan had failed, a result to which the navy had contributed by supplying Hull and Plymouth, and for which the royalists themselves, in refusing to leave their own areas, were much responsible. The Scots had entered the war on the side of Parliament, and in 1644 shut up Newcastle's forces in York. Waller checked Hopton's advance in Hampshire, and in May, Cromwell and Manchester joined the Scots before York. Rupert came N., skilfully relieved the city but was defeated at Marston Moor on July 2. This destruction of the king's N. army and the capture of York secured N. England for Parliament, and Charles was on the defensive for the rest of the war. There was, however, a temporary recovery during the remaining months of 1644, when Essex's foot were trapped at Lostwithiel, and Basing House was relieved. As a result Parliament decided to replace its outmoded systems of warfare. The New Model (to whose members the term Roundhead (*q.v.*) is most applicable) was estab. by an ordinance of Feb. 15, 1645, and commanded by Fairfax. By the Self-Denying Ordinance members of Parliament resigned their commands and left the question of reappointment to Fairfax. Philip Skippon (*d.* 1660), who had served in the Low Countries, and had been angered by Essex's desertion at Lostwithiel in 1644, was made major-general of foot and chief of staff, and Cromwell became lieutenant-general of horse, in May. In summer Fairfax took the field. Cromwell joined the New Model on June 13. On June 14 he and Fairfax decisively defeated Charles at Naseby. In July Fairfax came upon Goring's demoralised army at Langport, in Somerset. It broke and fled. In Sept. 1645 Montrose was defeated by Leslie at Philiphaugh. Hopton surrendered in Cornwall in March 1646, and Oxford fell in June. Charles had already surrendered to the Scots at Newark.

*The Second Civil War.*—In 1646 it was generally assumed by all but the extreme sectaries that Charles would be restored, with severely limited authority. Charles, however, was determined to regain his

former position, and, shut away from his moderate advisers, his restraint vanished. The numerically inferior Presbyterians caused bitter hatred amongst their opponents by adopting unnecessarily extreme measures, such as the abolition of the Prayer Book, and the levying of heavy fines on Royalists. Parliament then broke up its own party by attempting to impose a Presbyterian State Church on all, and by proposing to disband the largely independent New Model (*q.v.*), without receiving its arrears of pay. The army marched on London and expelled eleven leading Presbyterians from Parliament. This opened the phase in which the sectaries, whose part in causing the war was unimportant, became all powerful. In using them to fight their battles and, therefore, having of necessity to grant them temporary religious freedom and unprecedented liberty of speech, the more moderate Puritans had, in effect, surrendered to them control of affairs. Cromwell, one of the original Puritan opposition, rose to supreme power because of his generalship and emotional hold over his troops, and not by virtue of his parl. membership.

The victory of Independency in the Puritan struggle for power encouraged and enabled the king to come to terms with the Presbyterian Scots. The apparent indiscipline of the Eng. army and the fact that the Eng. Presbyterians (whose importance he very naturally overestimated) were quarrelling with their former followers made Charles think that he could win a quick victory over a divided enemy. The renewed sacrifice which the second war entailed ensured that countless Royalists, who had consistently supported Charles, would be financially ruined.

Charles' 'engagement' with the Scots of Dec. 1647 provided for a Scots invasion of England and a royalist rising. In July 1648 the Scots occupied Carlisle, but the following month, Cromwell, having marched from Pembroke, fell on them, and in a running battle from Preston to Warrington completely destroyed their army. Charles was captured.

The New Model was now supreme. In Dec. 1648 Pride 'purged' Parliament of all opposition, leaving a 'Rump' of fifty Independents. Cromwell and other army leaders had now decided that as Charles could never be trusted to keep to any agreement which they might make with him, his death was essential to safeguard ideals for which they had fought. His execution in Jan. 1649 drove the wavering Eng. Presbyterians over to an apathetic Royalism. Very soon some of the sectaries became disillusioned, and contemplated a compromise with Royalism. The Scots were generally agreed on the subject of loyalty to a Stuart king. These factors encouraged Charles II. to attempt a Restoration by force through Scotland.

*The War of 1650-61.* In 1650 Charles II. came to humiliating terms with the Scots Presbyterians. Cromwell, now commander-in-chief, crossed the Tweed in

July, but was hemmed in at Dunbar by Leslie. Then Leslie left his strong position on the hills, and on Sep. 3 was utterly destroyed. Within a year Cromwell was master of Scotland. A race to the S. between Cromwell and Charles's forces now began, but on Sept. 3, 1651, the royalist army was surrounded and destroyed in Worcester. After several narrow escapes, Charles II. reached France.

The Civil wars resulted in the immediate triumph of the army. England became a Commonwealth, ruled by a Council of State (dominated by Army leaders) and the Rump Parliament. The real source of the Commonwealth's power was its superb army of 50,000 veterans, mostly Independents, and Cromwell, its commander. These had executed the king in the name of the people only to find that many who had fought with them against him now disowned them for this deed. For a time, by sheer force, the Army was able to pursue its objectives. The Rump was dissolved; but the religious radicalism of the Barebones Parliament convinced Cromwell that only a more conservative attitude could save the essentials of the revolution, and the dissolution of this body marks the beginning of the end of army rule and the return to more traditional methods of gov. Throughout the Protectorate, old monarchical forms were gradually revived. Had Cromwell lived some years longer, a Cromwell dynasty might have been established in England. As he left no strong successor in his own family, his conservative policy, with its re-estab. of traditional ideas and interests, paved the way for a Stuart restoration (*q.v.*). But in spite of this the Civil wars effected a number of lasting changes. The interval of army power ensured the permanent estab. of a radical Nonconformity which had little connection with the religious ideals of most of the original Puritans, who had fought for an estab. Calvinist Church of England, and not for tolerated sectarianism. The Cromwellian excesses in Ireland contributed substantially and lastingly to Irish Catholic hatred of the Eng. Politically, the temporary victory of the Puritans ensured that England did not develop the form of monarchical absolutism which was springing up in other European countries, such as France, at the same date, and towards which Charles I.'s England was probably moving. The real victors of the Civil war were the wealthy merchants and landowners of the Ashley Cooper type who managed to support the winning side of the moment successfully throughout; in fact, the king returned on their terms, and the sacrifices of the small Royalist squirearchy and the New Model soldiery led to the estab. of an oligarchy from which modern Brit. democracy was eventually to evolve. One of the most astonishing features of the war was its failure to disrupt substantially the national economy. But though the country's financial position suffered comparatively little, no statistical records can illustrate adequately the

amount of personal suffering and private loss sustained during the conflicts, a factor vividly illustrated in the various family memoirs of the period.

See *Diaries, Journals, and Memoirs: Commons and Lords Journals for the Period: The Hatfield MSS; Pepys Diary; Evelyn's Diary; The Knyvett Papers*; D. H. Holles, *Memoirs, 1641-53, 1659*; *The Clarendon State Papers, 1767-86*; Frances P. and Margaret M. Verney (ed.), *The Verney Papers, 1892-99*; and T. E. Gibson (ed.), *The Crosby Records: A Cavalier's Notebook, 1887*. GENERAL. W. Prymme, *The Sovereign Power of Parliaments and Kingdoms, 1643*; J. Lacy, *The Old Troop, 1672*; Edward Hyde, Lord Clarendon, *History of the Great Rebellion, 1702*; T. Carlyle, *Letters and Speeches of Cromwell, 1850*; F. P. G. Guizot, *Life of Cromwell, 1854*.

1640. Documents of the Puritan Revolution (latest ed.), 1910; D. Masson, *The Life of Milton in Connection with the History of his Time, 1659-80*; H. A. Glass, *The Barebones Parliament, 1899*; W. A. Shaw, *A History of the English Church, 1640-60, 1900*; T. C. Pease, *The Leveller Movement, 1916*; C. H. Firth, *Oliver Cromwell and the Rule of the Puritans, 1923*; H. H. Tawney, *Religion and the Rise of Capitalism, 1926*; J. Buchan, *Oliver Cromwell, 1934*; G. Davies, *The Early Stuarts, 1937*; Margaret James, *Social Problems during the Puritan Revolution, 1938*; A. S. P. Woodhouse, *Puritanism and Liberty, 1938*; M. Ashley, *Oliver Cromwell, 1940*; Mary Coate, *Cornwall in the Civil War, 1933*; W. Sehenk, *The Concern for Social Justice in the Puritan Revolution, 1948*; D. Mathew, *Social Structure in Caroline England, 1948*; and J. E. Neale, *Tudor Parliament, 1949*.

**War, Great**, see WORLD WAR, FIRST.

**War, Second World**, see WORLD WAR, SECOND.

**Warasdin**, see VARASDIN.

**Waratah**, tn. of New S. Wales, 4 m. N.W. of Newcastle. There are coal mines, and steel works. It is a popular residential dist.

**Warbeck, Perkin** (1471-99), pretender to the Eng. throne in the reign of Henry VII. He was a native of Tournai, and appeared in 1490 at the Burgundian court as the younger of the two princes whom Richard III. was held to have murdered in the Tower of London. He was taken up by the Yorkists, and received at the court of the Fr. king. Going to Scotland, he was received by James IV. In 1498 he invaded the S.W. of England, besieged Exeter, but was captured and brought to the Tower. In the following year he escaped, but was recaptured and executed at Tyburn.

**Warblers**, or *Sylviidae*, family of passerine birds distinguished from the thrushes by their more delicate structure and more subulate bill. They include some of the choicest songsters. Among the numerous Brit. Ws. are the

nightingale (*Daulias lusciniæ*), robin (*Eritacus rubecula*), chaff-chaff (*Phylloscopus collybita*), gold-crested wren (*Regulus cristatus*), and the hedge sparrow (*Acceptor modularis*). The birds popularly called Ws. include the garden W. (*Sylvia salicaria*), the lesser whitethroat (*Sylvia curruca*), the grasshopper W. (*Acrocephalus naevius*), the Dartford W. (*Melosphebus undatus*), the reed W. (*A. streperus*), and the sedge W. (*A. phragmitis*).

**Warburg, Otto Heinrich** (b. 1883), Ger. physiological chemist, b. at Freiburg im Breisgau, studied chemistry under Emil Fischer. He became a prof. at the univ. of Berlin, and at the Kaiser Wilhelm Institute of cellular physiology. He worked on the chemistry of the living cell, and on the principles of metabolism, and made important discoveries about fermentation, breathing, and the assimilation of carbonic acid. In 1931 he received the Nobel prize for chemistry.

**War Crimes**, see CRIMES, WAR; INTERNATIONAL LAW, International Law and War Crimes; NUREMBERG WAR CRIMES TRIALS.

**Ward**: 1. In Eng. law, a minor who has been legally placed under the care of a guardian (q.v.). 2. Electoral div. of a parl. or municipal bor. See also BAILEY.

**Ward, Artemus**, see BROWNE, CHARLES FARRAR.

**Ward, John Quincy Adams** (1830-1910), Amer. sculptor, b. at Urbano, Ohio. From 1850 to 1856 he studied under H. K. Brown, assisting him with the equestrian statue of Washington in Union Square, New York. In 1861 he opened a studio in New York City. In 1863 his 'Indian Hunter' was erected in Central Park, where also are his 'Froedman' and 'Shakespeare.' He executed the colossal statue of Washington for the Treasury Buildings.

**Ward, Sir Joseph George** (1856-1930), New Zealand statesman, b. in Melbourne. He was postmaster-general and colonial secretary, 1899-1906, Prime Minister 1906-1912; he represented New Zealand at the Imperial Conferences in London, 1907, 1909, and 1911. He was created a baronet in 1911. He was again Prime Minister, Dec. 1928-May 1930.

**Ward, Sir Leslie** (1851-1922), Eng. artist, b. in London, known by his pseudonym 'Spy.' He became famous as a caricaturist for *Vanity Fair* (1873-1909), among his most characteristic drawings being those of lawyers. He was knighted in 1918. He wrote *Forty Years of Spy*, 1915.

**Ward, Mary Augusta** (Mrs. Humphry Ward) (1851-1920), Brit. novelist, b. at Hobart, Tasmania. She attended boarding schools in England, settled at Oxford, 1867, and married, in 1872, Thomas Humphry Ward, tutor of Brasenose. She contributed (like her husband) to *The Times*. Her fame rests mainly on *Robert Elsmere* (1888), a narrative of religious crisis. See lives by S. Gwynn, 1917; and J. P. Trevelyan, 1923.

**War Debts**, see DEBTS, INTER-ALLIED.

**War Decorations**, see DECORATIONS FOR WAR SERVICES, and STAR.

**Warden**, in England, officer appointed for the naval or military protection of some particular dist. The W. of the Cinque Ports was created by William the Conqueror with extensive jurisdiction over the adjacent coast land. The Ws. of the marches were appointed to protect the boundaries between England and Scotland or Wales. It is the title of the heads of some univ. colleges.

**War Department of the U.S.A.** (since 1947 the **Department of the Army of the National Military Establishment**), was created by act of Congress in 1789, succeeding a similar dept. which was estab. prior to the adoption of the Constitution. Subsequent acts and executive orders have greatly altered the scope and functions of the dept. since its inception, as it originally encompassed many activities later delegated to the Navy and Interior Depts. The National Security Act of 1947 transferred the dept. to the newly created National Military Establishment and redesignated it the Dept. of the Army. The Secretary of War assumed the title Secretary of the Army. The dept. is charged with responsibility for organising, training, maintaining, and equipping the U.S. Army. For the administration of the navy see *under* NAVY DEPARTMENT OF THE U.S.A. The Dept. of the Air Force was estab. as an executive dept. in the National Military Establishment by the Act of 1947.

**Wardha**, dist. of the Central Provs., India in the Nagpur div. Cotton, hemp, wheat, and pulses are grown. Area 2435 sq. m. Pop. 519,300.

**Wardmote**, in the city of London an ann. court or meeting held in each ward of the city under the presidency of the alderman. Its powers, which formerly extended to matters concerning the watch, the police, etc., are now merely nominal. The common councillors of the city are elected at the W.

**Wardroom**, originally, in the days of wooden warships, the big cabin in the after part underneath the captain's apartments. The term dates from about 1750, the W. being used as a lieuts.' mess, where they also slept. The name is supposed to be derived from 'wardrobe' as the place where officers kept their clothes before they had a communal mess. In modern times the wardroom became the mess in men-of-war for officers of all branches of and above the rank of lieut., but, in 1949, Branch (former Warrant) officers were also admitted to the wardroom.

**Wardship**, in feudal times, was an incident of tenure by knight service. This right gave the lord the guardianship in chivalry of the heirs (males under twenty-one and females under fourteen) of his tenants, and with such guardianship the right to the lands of the heir, without having to account for the profits, until the heir came of age. W. was abolished under the Commonweath.

**Ware**, urban dist. of Hertfordshire, England, on the Lea, 2 m. N.E. of Hertford. It has manufacturing chemists, malting, plastics, engineering, stationery, coach-building, glove-making,

and numerous other small industries. 'The Great Bed of W.', once at the 'Saracen's Head,' is now at Rye House. Pop. 6200.

**Wareham**, municipal bor. and mrkt. tn. of Dorsetshire, England, on the Frome, near Poole Harbour, 15 m. E. of Dorchester. It has remains of a Brit. earthwork. The church of St. Mary contains the coffin of King Edward the Martyr. W. was a medieval port of some importance. Stone, clay, and lime are worked. Pop. 3000.

**War Graves**, see GRAVES, SOLDIERS'.

**Warkworth**, small tn. of Northumberland, England, on the Coquet, 1 m. from the N. Sea, 6 m. S.E. of Alnwick. The ruins of W. castle and W. hermitage (mentioned in Percy's *Reliques*) are near by. Pop. 720.

**War Loan**, see *under* PUBLIC DEBT.

**Warlock, Peter** (pen-name of Philip Heseltine) (1894-1931), Eng. composer, b. in London. He studied under Colin Taylor at Eton and under Delius and Bernard van Dieren. He founded the *Sackbut* in 1920 and ed. it for a year. Compositions include: *An Old Song*; *The Curlew*; a song-cycle (a Carnegie award, 1923); *Saudades*; *Peterisms*; *Corpus Christi*; and numerous separate songs; also (with Philip Wilson) ed. 150 old Eng. airs. He pub. *P. Delius* (1923); *The English Ayre* (1926). See memoir by C. Gray, 1934; and H. Foss, *British Music of our Time*, 1946.

**War Medal, British**: 1. Issued in July 1919, to record the successful conclusion of the First World War, and awarded to all officers and men of the Brit., Dominion, Colonial, and Indian Forces, members of women's formations enrolled for service with the Forces, and members of military hospitals and kindred organisations, who either entered a theatre of war on duty, or who left their places of residence and rendered approved service overseas between August 5, 1914, and November 11, 1918 inclusive. The medal is in silver for all except Brit. subjects enrolled in native labour corps units, for whom the medal is cast in bronze. The ribbon has an orange centre, watered with stripes of white and black on each side with borders of royal blue. The winning design was that of Wm. McMillan, a young Scottish sculptor, who also won the prize for the best design for the Victory Medal (*q.v.*). 2. Instituted in 1948 for service in the Second World War. The obverse of the cupro-nickel medal bears the royal effigy, crowned, and the reverse, designed and modelled by E. Carter Preston, shows a lion standing triumphant on the body of a double-headed dragon, the two heads, an eagle's and a dragon's, signifying respectively the prin. occidental and oriental enemies in the Second World War. The medal is 1.42 in. in diameter. The ribbon has stripes of red, white, and blue.

**Warminster**, tn. of Wiltshire, England, at the S.W. extremity of Salisbury Plain, midway between Bath and Salisbury. It has an early fourteenth century church, the theological college of St. Boniface, and

an eighteenth century grammar school. Longleat House and Park is 5 m. S.W., and Shearwater 2 m. S. W. is an army training centre and workshop dépôt. Silk, gloves, and agric. machinery are produced, and there is an anct. market. Pop. 8700.

**Warne, Frederick, and Co., Ltd., Eng.** publishing firm founded in 1865 by Frederick Warne (1825-1901), who had been from 1849 a partner in the firm of Routledge, Warne and Routledge. Among the early publications of the new firm were *Nuttall's Standard Dictionary* and the *Chandos Classics*. When Frederick Warne retired in 1896, the firm was taken over by his three sons, and in the year 1919 was turned into a Limited Company.

**Warnesfridus, see PAUL THE DEACON.**

**Warner Brothers' Pictures, Amer.** film-making organisation. The company's studios of 140 ac. are in Burbank, California. In 1903 the late Sam Warner with his brothers Harry M., Jack L., and Albert, started to show films in a converted shop. In 1912, when they had acquired five theatres, they decided that the best way to secure a sufficient supply of films was to make them. They were pioneers in the field of 'talkies,' making 'The Jazz Singer,' and the 'Lights of New York.'

**War Office,** the headquarters of the Brit. Army, situated in Whitehall, London. The dept., during the early years of the present century was thoroughly overhauled and its organisation revised on the recommendation of a specially appointed committee over which Lord Esher presided. An Army Council was formed which consisted of the secretary and under-secretary for war, together with the financial secretary and four military members (chief of the imperial general staff, adjutant-general to the forces, quarter-master general to the forces, and master general of the ordnance). The present composition of the council includes the vice-chief and the deputy chief of the imperial general staff, and the permanent under-secretary of state for war (secretary of the council), and omits the master general of the ordnance. Each of the military members has some special dept. of the military service to superintend. The vice-chief is responsible, broadly speaking, for operations, while the deputy chief is responsible for Army organisation policy; and they are responsible directly to the secretary of state for war, who is, of course, directly responsible to Parliament. The inspector-general of the forces, who took the place of the former commander-in-chief, carried out the plans of the Army Council and reported upon the efficiency of the men and the utility of the reforms; this post has now been abolished, and the duties allocated to a director of military training, with subordinate directors to assist.

The beginning of the present W.O. is to be found in the appointment of a 'clerk to the general' in Charles II.'s days. The expressions 'secretary to the forces' and 'secretary to the council of war' were also current and appear to

have developed into the 'secretary-at-war.' This official was in the nature of a private secretary to the commander-in-chief, but the office grew in importance and considerable administrative duties were attached to it. The Board of Ordnance was always quite distinct from the W.O., but in 1855 it was abolished and its functions merged in the W.O. The executive head of the W.O. is the Army Council, presided over by the secretary of state for war.

**Warrandice,** in Scots law, the obligation by which a party conveying a subject or right is bound to indemnify the grantee, disponent, or receiver of the right, in case of eviction, or of real claims or burdens being made effectual against the subject, arising out of obligations or transactions antecedent to the date of the conveyance. W. is either *personal* or *real*. *Personal W.* is that by which the grantor and his heirs are bound personally. *Real W.* is that by which certain lands, called warrandice lands, are made over eventually in the security of the lands conveyed. Though the term 'covenant' is unknown to Scots law, its place is to some extent filled by the doctrines of the W.

**Warrant,** instrument authorising one to do something which otherwise he has no right to do. In England a police W. is issued by a justice on a written and sworn information of an offence; it is addressed to the constables of his dist., specifies the offence, describes the person accused, and commands the police to arrest him and bring him before justices to answer the charge. It remains in force until executed, and if the criminal escapes into another dist. the W. can be 'backed' by indorsement of the justices of such dist., so to be enforceable against the criminal in such dist. A general W. (i.e. one which purports to authorise the arrest of unnamed persons without previous evidence of their guilt or knowledge of their persons) to seize suspected persons and a general search W. empowering messengers to seize documents are alike illegal. The term W. is also used for documents authorising the payment of dividends or the delivery of goods out of bond. A distress W. is one that authorises the sheriff's officer to seize goods for arrears of rent.

**Warrant of Attorney,** written instrument executed by one person authorising another to confess judgment against him in an action for a certain named amount. It is often given by way of security by a prospective debtor and enables the creditor to obtain judgment against the debtor without the delay and expense of an action.

**Warrant Officers, see under RANK.**

**Warranty.** In Eng. law a W. within the meaning of the Sale of Goods Act, 1893, is an agreement with reference to goods which are the subject of a contract of sale, the breach of which gives a right to sue for damages, but not to reject the goods or treat the contract as repudiated. A representation made by the seller at the time of sale will only amount to a W. if

made with that intention, and the test of such intention is to determine whether the seller purported to assert a fact of which the buyer was ignorant. If not, then there is no W. A general W. does not give a right to sue in respect of defects obvious to both parties, but in this respect it is to be observed that a purchaser is not bound to use extreme diligence in finding defects.

**Warren, Leicester**, *see* DE TABLEY, JOHN BYRNE LEICESTER WARREN.

**Warren** : 1. Co. seat of Trumbull co., N.E. Ohio, on Mahoning R., 53 m. S.E. of Cleveland. Trumbull is the leading dairy co. of Ohio and is well known for its stock and good farmland. It produces maple sugar and syrup, and has manufs. of machinery, boilers, furniture, electric lamps and appliances, pottery, and steel, and iron and coal mines. Pop. 42,900. 2. Co. seat of W. co., Pennsylvania, U.S.A., on the Conewango and Allegheny Rs., 49 m. E.S.E. of Erie. Oil and natural gas abound, iron-ore and petroleum are found. W. has oil refineries, iron and chemical works, foundries, silk, woollen, and flour mills, and manufs. furniture. It is named after the Amer. patriot, Joseph W. Pop. 14,900.

**Warren**, enclosure made for the breeding of rabbits. The term W. also denotes a fish or game preserve.

**Warrington**, municipal and parl. bor. of Lancashire, England, on the Mersey, 16 m. from Liverpool and Manchester. It is on the Manchester Ship Canal below the Latchford locks. W. played a prominent part in the rise of nonconformity in the seventeenth century. An interesting building is the one-time Old Academy opened in 1757 as a home of intellectual culture for Lancashire generally. A circulating library, founded in 1760, became the nucleus of the first municipal rate-supported public library in Great Britain, 1848.

In Rom. times W. was a place of considerable strategic value, the ford over the Mersey at this point being for centuries the prin. connecting link between N. and S., and to guard the ford the Rom. station *Verulamium* was estab. W. by the name of *Walintune*, appears in Domesday Book.

In the Middle Ages W. was one of the prin. centres in the country for linen, flax, and hemp, and its armourers founded its present reputation for files and tools. In the eighteenth century wire-drawing, shipbuilding, sailmaking, the making of clocks and watches, and brewing estab. the growing tn. to meet the struggles of the industrial revolution. The chief groups of industries in W. to-day are metals manuf., including, especially, wire of all varieties, tool-making, engineering products of all kinds, gas appliances; leather; soap, chemicals, and glycerine; glues and gelatines; seeds; and brewing. Pop. 78,200.

**War Risks State Insurance Scheme**, *see* under INSURANCE.

**Warriston, Lord**, *see* JOHNSTON, ARCHIBALD.

**Warrnambool**, seaport of Villiers co.,

Victoria, Australia, on Lady Bay, 50 m. from Portland. It has a fine harbour, and a lighthouse on the N. shore of the bay. There are freestone quarries. Pop. 9900.

**Warsaw**, cap. of Poland on the l. b. of the Vistula. After the Ger. occupation during the Second World War, the whole of W. was left a mass of ruins in which even the lay-out of the streets was obliterated. Only the industrial suburb of Praga on the r. b. of the Vistula and a few isolated buildings elsewhere, which the Gers. had kept for their own use, remained standing. Nearly 75 per cent of buildings were totally destroyed, as well as all five bridges across the Riv. and half of the water, sewerage, and electricity services. Some ten per cent of housing space survived the war and twenty per cent had been restored two years after the war. One of the greatest achievements of W.'s reconstruction during these two years was the rapid restoration in nine months of the enormous Pomatowski Bridge across the Vistula. Greater W. was the subject of a comprehensive plan, correlated with an even larger regional plan, planned to change the character of W. both functionally and topographically, besides giving the inhabs. a new road system. The anc. city grew concentrically round the citadel on the escarpment above the riv. The plan converts it into a system of parallel strips running N. and S., with gov. buildings along the riverside escarpment, and the shopping, entertainment, and commercial centres to the W. There is a new belt of light industry still further W., and an area of heavy industry adjoining Praga, where new docks are to be constructed. Work began in 1948 on the reinforced concrete tunnel to carry a new E.-west road artery under the Old Town (Stare Miasto) of W. Pop. (1939) 1,289,000; (1948) 606,800. *See also* EASTERN FRONT OR RUSSO-GERMAN CAMPAIGNS IN THE SECOND WORLD WAR.

**War Shock**, *see* under PSYCHONEUROSIS; PSYCHOPATHOLOGY; SHELLSHOCK.

**Wars of the Cross**, *see* CRUSADES.

**Wars of the Roses**, *see* ROSES, WARS OF THE.

**Warsop**, tn. of Nottinghamshire, England, 5 m. from Mansfield, on the Meden. The prin. industry is coal-mining. The tn. has a thirteenth-century church. Pop. 10,800.

**Wart**, or **Verruca**, excrescence caused by excessive growth of the tissues of the papillae of the skin. Little is known of the manner in which Ws. are formed, and they usually appear and disappear without any apparent cause, especially in the young. In some cases the cause seems to be infection by a virus. They are very vascular, and are covered with some thickness of scaly epidermis, which easily becomes rubbed off. In children, they cause little inconvenience, and will ultimately disappear if left alone; but since they are very infectious, schools, etc., always insist on stringent treatment at once, e.g. with gentian violet ointment. In adults they can be removed surgically using ethyl chloride or novocaine as a local anæsthetic; X-ray

treatment is also used, but the surrounding skin must be protected.

**Warta** (Ger. *Warthe*), riv. of Poland, rising in the Carpathians, about 35 m. from Cracow, flowing N.W. and W. past Poznan to join the Oder at Kostrzyn (Küstrin). It is about 450 m. long.

**Wart Hog**, genus of African pigs (*Phacocharus*) with two species. Resembling the wild boar, it is distinguished by the large head, four large tusks and at each side of the face large wart-like pads. Both species (*P. aethiopicus*, found in the S.E. regions, and *P. africanus* found over most of Africa) have a mane of bristly hair on neck and back.

**Warton, Thomas** (1728-90), Eng. poet b. at Basingstoke, and educated at Trinity College, Oxford. In 1757 he became prof. of poetry at Oxford. He is famous for his *History of English Poetry* (1774-81). His ed. of Milton's minor poems is of a high standard. He was made poet-laureate in 1785, and in the same year Camden prof. of history, and was once of the first to detect the Chatterton forgeries. See life by C. Rinkner, 1916; and E. Gosse, *Two Pioneers of Romanticism: Joseph and Thomas Warton*, 1915.

**War Transport**, Ministry of, see TRANSPORT, MINISTRY OF.

**Warville, Jacques Pierre Brissot de**, see BRISSOT.

**Warwick, Guy of**, see GUY OF WARWICK. **Warwick, Richard Neville, Earl of** (1428-71), surnamed the Kingmaker. He was the eldest son of the earl of Salisbury, and married the daughter and heiress of the earl of Warwick, succeeding to the title in 1449. He was the most active and influential of all the supporters of the Yorkist house. Later he and Edward VI. quarrelled; W. went over to the Lancastrians, and was killed at the battle of Barnet in 1471. See further under ROSES. **WARS OF THE**. See C. Oman, *Warwick the Kingmaker* (2nd ed.), 1903.

**Warwick** : 1. Mkrt. tn., municipal bor., and cap. of Warwickshire, England, on the Avon, 21 m. S.E. of Birmingham. According to some the name of the tn. is derived from *Warremond*, first king of Mercia, the spelling in very early days being *Warrewyk*. The story of W. is closely linked with that of its castle, built in the fourteenth century, following upon earlier structures dating back to Saxon times, one of the most perfect existing specimens of its age. W. grammar school existed in the reign of Edward the Confessor, and it may date back to 914. The collegiate church of St. Mary, with an exceptionally fine tower (174 ft.) is a well-known landmark. The Leysoster Hospital, a fourteenth century almshouse, is regarded as one of the finest of its kind in the country. Chief occupation of the tn. is agric.; manufs. include agric. implements, edible gelatines, lozenges and other sweetmeats, mechanical and motor engineering products, carpets, motor caravans, and pistons. W. forms a single parl. div. with Leamington. Pop. 14,600. 2. Tn. of Rhode Is., U.S.A., in Kent co., on Narragansett Bay, with manufs., especially cotton. Pop. 28,700.

3. Tn. of Merivale co., Australia, on Contadamine R., in an agric. and wine-growing dist. There are also gold and coal mines, and quarries of marble and stone. Pop. about 28,800.

**Warwickshire**, midland co. of England, bounded on the N. by Staffordshire, S. by Gloucestershire and Oxfordshire, E. by the shires of Leicester and Northampton, and W. by Worcestershire. The surface is very variable, though there are no great elevations, Broom Hill (830 ft.) being the highest. The prin. rivs. are the Avon, with its numerous tribs., which runs right across the co., the Stour, and the Tame. In the W. is the region that was once the forest of Arden, made famous by Shakespeare. The co. possesses immense coalfields in the N.E.; ironstone, lime, and cement are also worked. Almost the whole co. is under cultivation; dairy farming, fruit growing, and market gardening are carried on, and oats and wheat are the main crops. In the N.W. is the great industrial centre of Birmingham, and other industrial centres include Coventry. Besides the above-mentioned tns. the most important are Leamington, famous for its Spa, Nuneaton, Rugby, Solihull, Stratford-on-Avon, the b.p. of Shakespeare, Sutton Coldfield, and Warwick, the co. tn. The co. is divided into six parl. divs. There is a univ. at Birmingham. The co. is famous for its antiquities, Warwick Castle and Kenilworth Castle being the most famous. The Beauchamp Chapel at St. Mary's Church, Warwick, is notable, and there are ruins of a Cistercian monastery at Combe Abbey near Coventry, besides others at Morevale, Stoneleigh, Maxstoke, Kenilworth, and Wroxall. Edgehill gave its name to the battle of 1642, in the Civil war. The area of the geographical co. is 982 sq. m. Pop. 1,846,860. See *The Victoria County History*, vols. I.-V., 1904-08; A. Mee, *Warwickshire*, 1942; and A. Burgess, *Warwickshire*, 1950.

**Warwickshire Regiment, Royal**. This Eng. regiment, originally the 6th Foot, was raised in 1673 for service under the Dutch Gov. It came on to the Brit. estab. in 1680 and served under William III. at Namur, 1695. At the beginning of the eighteenth century it served as marines on both sides of the Atlantic, and reverted to a foot regiment about 1705, suffering heavily at Almanza in Spain, 1707. After a period in the W. Indies, the regiment served with much distinction under Wellington in the Peninsula. Further honours were gained at Niagara, S. Africa (1846-47), Khartoum (1898), and S. Africa (1899-1902). During the First World War thirty battalions were raised and served in France, Flanders, Italy, Gallipoli, Mesopotamia, and Persia. In the Second World War the regt. fought in France, N. Africa, and Italy, and notably in the battle of Normandy (1944).

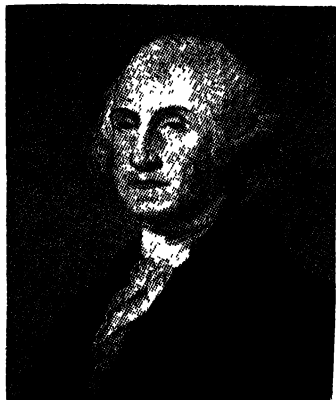
**Wasdale, or Wastdale**, valley in S.W. Cumberland, England, with Wastwater, a lake nearly 3 m. long.

**Wash, The**, inlet (22 m. by 15 m.) of the N. Sea, on the E. coast of England.

between Norfolk and Lincoln cos., receiving the Welland, Ouse, Nen, and other rivs. Its shores are low and marshy. In 1948 a reclamation project was planned, 5000 ac. being reclaimed by March 1949.

**Washing Machines**, see under LAUNDRIES.

**Washington, George** (1732-99), first president of the U.S.A., b. at Bridge's Creek, Westmoreland co., Virginia. He was descended from pure Brit. stock from Sulgrave Manor, Northamptonshire, his great-grandfather, John W. having migrated in 1637. Largely self-taught, he began his career as a land surveyor, but inheriting the Mt. Vernon estate from his brother Lawrence, W. settled down as



GEORGE WASHINGTON

a country gentleman. He had made a good impression on Governor Dinwiddie, and the latter soon made him adjutant of the Virginia military. In May 1755, W. was ordered to drive the Fr. out of Fort Duquesne. He succeeded, but was in turn besieged in Fort Necessity, and on July 4 surrendered.

W. now resigned command of the Virginia troops and married a rich widow, Martha Custis. The union of their plantations made W. one of the wealthiest men in his State. W. threw himself into the work of looking after his estates. He entertained lavishly, and thus came into contact with notable men from all over the Eng. colonies in America. He was elected to the Virginia House of Burgesses, and re-elected. He soon displayed a growing interest in the disputes between the colonies and the Eng. Crown, and Virginia elected him as one of its delegates to the First Continental Congress. In Philadelphia he bought arms and munition which he sent to Virginia, and when the Congress adjourned he returned to Virginia to take up the active training of the raw soldiers.

When the Second Continental Congress met in Philadelphia, the general feeling

among the New Englanders was that they must have a Southern man to lead them, since only thus could they be sure of uniting all the colonies in one common cause. War had already started, and John Adams (q.v.) proposed W. as commander-in-chief of the colonial armies and on June 15, 1775, W. took over the command. The Amer. troops often lacked arms, munitions, food and clothes; and W. had to combat faction and treachery among his generals, including the episode of Benedict Arnold's (q.v.) treachery. Knowing the jealousy of Congress, W. kept in close touch with it, and let its members know his every move and every motive. When he took charge of the Amer. forces at Boston he won a notable success. His occupation of Dorchester Heights compelled Howe to evacuate Boston in March 1776. He then had a succession of reverses, notably at the battle of Brooklyn Heights, but in New Jersey he turned and beat his enemy at Trenton and Princeton. Following his defeats in the battles of the Brandywine and Germantown in the autumn of 1777, W. led his 11,000 men into winter camp at Valley Forge, 20 m. from Philadelphia. The spring brought better news for the Amers. The Fr. were coming into the war. Clinton, who succeeded Howe, had been ordered to give up Philadelphia and return to New York. W. harassed his troops, notably at the battle of Monmouth. When Clinton reached New York, W. took up a position at White Plains and for three years, while fighting was going on elsewhere, the two armies watched each other. At last, W.'s chance came when Cornwallis met with difficulties in N. Carolina, withdrew his army to Virginia, and finally shut himself up in Yorktown. Here W., who had hurried S., forced him to surrender (1781). When the Brit. finally moved out of New York for home the Amer. army under W. entered the tn. A few days afterwards, on Dec. 4, 1783, W. went via Philadelphia to Annapolis, Maryland, where Congress was sitting. Here on Dec. 23 he resigned his commission as commander of the armies.

For four years he strove to recoup his shattered fortunes. At length it was decided to call a convention to frame a constitution, and W. was chosen as one of the Virginia delegation. The convention opened May 13, 1787, in Philadelphia, and W. was unanimously chosen to preside. Others wrote the constitution, but it was W. who did much to remove difficulties. He was unanimously chosen as first president of the republic, although he was reluctant to assume the burden. He was inaugurated April 30, 1789. (See UNITED STATES OF AMERICA.—History for the events of W.'s presidency.) W. wished to retire at the end of his first term, but at the instance of the rival leaders, Thomas Jefferson and Alexander Hamilton, he was elected to a second term by a unanimous vote. He declined a third term, being weary of the unjust attacks of bitter partisans. On giving up office, he made a famous farewell address, warning the country against

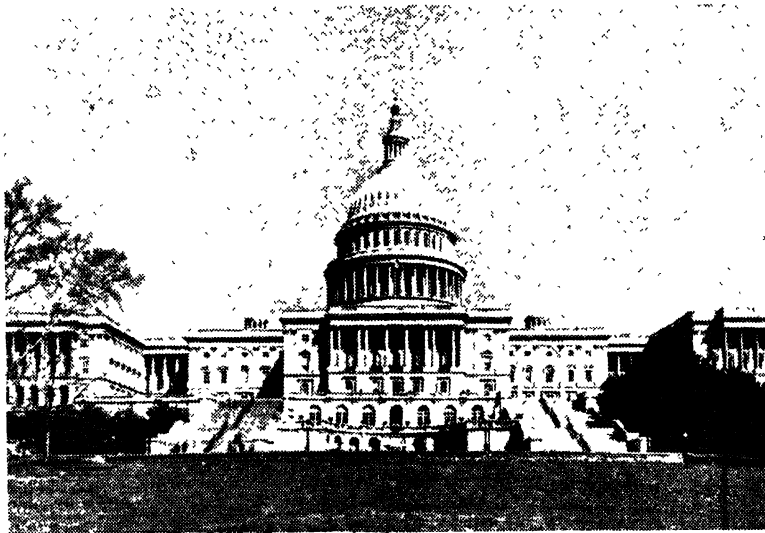


entangling alliances and advising it to keep aloof from European quarrels.

W. was pre-eminently a product of the Virginia of his time with a solid, disciplined character, neither brilliant nor profound. The force which brought him to pre-eminence was an honourable but overmastering ambition for public esteem, a determination not to remain an obscure Virginian, and a sincere regard for what he considered to be the best interests of the Thirteen States.

His *Letters and Papers* were ed. by J. Sparks (1833-9), and *Writings of Washington*, by W. C. Ford (1889-93). See lives

1800. George Washington himself was responsible for its original plan and took great interest in the city that was to bear his name. The city was regularly laid out according to the design of Major l'Enfant, a Fr. engineer. The Capitol is the central site. This splendid building on a rising ground at the E. end of Pennsylvania Avenue. It was built to the design of Sir Wm. Thornton, a Brit. W. Indian. The cornerstone was laid by George Washington in 1793, but the building was burned by the Brit. in 1812. The erection of the present building was begun in 1818 by Bullfinch; it is con-



United States Information Service, American Embassy

#### THE UNITED STATES CAPITOL, WASHINGTON

by J. Marshall, 1804-7, W. Irving, 1855-9, W. E. Woodward, 1926, R. Hughes, 1926-7; also M. Ashley, *Mr. President*, 1918; and D. Southall Freeman, *George Washington* (vols. i. and ii.), 1949.

**Washington**, cap. of the U.S.A., in the Dist. of Columbia, an area of 62 sq. m. enclosed by the State of Maryland, except in the S.W., where the Potomac R. forms the boundary. W. stands on the l. b. of the Potomac R., which is navigable for large vessels up to this point. A portion of the dist. of Columbia (D.C.), embracing 6654 ac. is known in law as the City of W., 'the Federal Capital.' But that name is a geographical distinction only, as the ter. it includes is not a municipal gov., separate from the rest of the dist. of Columbia, but is subject to the same national and municipal control. W. was made the capital by an Act of Congress passed in 1790, and the gov. was transferred there from Philadelphia in

constructed of freestone and consists of a central block and two wings, in the N. of which is the Senate Chamber. The prin. feature of the capitol is the rotunda, 96 ft. in diameter and height 285 ft. above the ground. At the other end of Pennsylvania Avenue is the White House, the official residence of the president of the U.S.A. The city has many other magnificent buildings, among which may be named the Patent Office, the General Post Office, the National Observatory, the Corcoran Gallery of Art, the Columbian Univ., and the Howard (coloured) Univ. There are also the Georgetown Univ. and the George Washington Univ.

W. is, in many aspects, the most beautiful city in the U.S.A., with its white stone and marble gov. buildings and wide tree-shaded avenues. Between the State Dept., near White House grounds, and the Capitol are sev. gov. buildings. The National Gallery of Art and the Congress

Library are also particularly notable. The magnificent stone bridge across the Potomac is 1452 ft. long, and connects W. with the Arlington National Cemetery. On the Virginia side of the Potomac stands the Pentagon (q.v.) the world's largest office building, accommodating Amer. War Dept. personnel and built 1941-43. W. is mainly a residential city. The U.S. Gov. employs large numbers of citizens in the offices of the various depts., and normally employs thousands of people in its engraving, printing, bookbinding, and manufacturing depts. The country community is mainly agric., flowers and foliage plants forming 60 per cent of the total agric. products. Dairying is also important. The manufs., like the agriculture, are mainly incidental to the needs of the cap. Slaughtering and meat packing are important occupations, there are planing mills, and marble, granite, and other stones are dressed, and there is a naval shipyard. Printing and publishing are leading industries, and there are bakery manufs. W. has railroad connections with most of the important tns. of the U.S.A. It is 38 m. from Baltimore, 136 m. from Philadelphia, and 226 m. from New York. Sev. important treaties have been signed here (see WASHINGTON CONFERENCE (1921); WASHINGTON, TREATIES OF). About one third of the pop. is Negro. W. is subjected to control by Congress and by Commissioners appointed by the President and confirmed by the Senate. Since 1895 W. by Act of Congress has been made co-extensive with the District of Columbia. Pop. (1940) 663,000; (estimated 1947) 861,000, an increase largely due to the war. See W. B. Bryan, *A History of the National Capital*, 1924-26; Wm. T. Hall, *Standard History of the City of Washington*, 1914; C. Moore, *Washington Past and Present*, 1929; and H. P. Caemmerer, *A Manual on the Origin and Development of Washington*, 1939. 2. City of Pennsylvania, U.S.A., co. seat of Washington co., 25 m. from Pittsburgh. It is a well-built city, the seat of Washington and Jefferson Colleges and of Washington Seminary. It has iron, and steel works, and produces wool, glass, chemicals, molybdenum, and ferro-alloys. It has coal mines and natural gas and oil wells. Pop. 26,200.

**Washington**, the 'Evergreen State,' Pacific State of the U.S.A., was formerly part of Oregon. It is situated in the extreme N.W., bounded N. by Brit. Columbia, E. by Idaho S. by Oregon, W. by the Pacific Ocean. It was created a ter. in 1853 and in 1889 was admitted to statehood. The State is traversed from N. to S. by the Cascade Range, whose general altitude is between 6000 and 7000 ft., but there are sev. volcanic peaks rising above 10,000 ft. Mt. Rainier (or Tacoma) reaches 14,408 ft.; it is surrounded by a national park. There is also a lower, coastal range in the W., the Olympic Mts. In the N.W., between the two ranges, Puget Sound, an inlet with many harbours, on which stand cities such as Seattle, Tacoma, and Olympia, is an important commercial

centre. The Columbia R. enters the State from Brit. Columbia on the N. and flows along 300 m. of its S. boundary. Its chief affluent is the Snake R., which joins it near S. Ainsworth. E. of the Cascades are stretches of arid or semi-arid land, with fertile arcas. Here are great cattle and sheep ranges, and here also much wheat is grown. Wheat is also grown in the W., which receives a heavy rainfall, and has a profuse vegetation. Agriculture is the chief industry, barley, oats, and maize being grown as well as wheat. Fruit is also an important product, W. having the largest apple crop of all the States. More timber (chiefly coniferous) is cut here than in any other State. The mining of coal, copper, mercury, lead, magnesite, zinc, silver and gold is also carried on. The State produces 30 per cent of the nation's magnesite and 35 per cent of its lead. Other minerals include mercury, clay products, limestone, marble, granite, platinum, tungsten, and diatomite. Aluminium refining is important. The Grand Coulee Dam is part of the Columbia R. reclamation project; other dams are Bonneville and McNary. Industrial estab. include lumber and planing mills, and flour mills; meat-packing and the manuf. of dairy products are important; shipbuilding and aircraft manuf. expanded greatly during the Second World War. Seattle is the landing-place of the N. Pacific fisheries and handles also the bulk of the Alaskan trade and much Asiatic and Panama Canal trade. There are eighteen Indian reservations in the State, the largest being that of Coleville. The cap. is Olympia (pop. 13,300), and the chief cities are Seattle (368,000), Spokane (122,000), Tacoma (109,400), Everett (30,200), and Bellingham (29,300). The University of Washington, near Seattle, had an attendance in 1947-48 of 18,000 students, and the State College at Pullman for Science and Agriculture (founded 1890), 7200 students. The area of the State is 68,192 sq. m. and the pop. (1948), 2,487,000. See E. S. Meary, *History of the State of Washington*, 1924; L. Pollard, *History of the State of Washington*, 1937; and Federal Writers' Project, *Washington: A Guide to the Evergreen State*, 1941.

**Washington**, urb. dist. of Durham, England, 6 m. from Gateshead; coal-mining, quarrying, iron, steel, and chemical manufs. are carried on. It was the home of George Washington's earliest forbears. Pop. 17,600.

**Washington, Treaties of:** (1) That made in 1846 with Great Britain by which the boundary W. of the Rocky Mts. was estab. (2) That made in 1854 with Great Britain relative to fisheries, duties, and navigation in British N. America, often called the 'Reciprocity' Treaty. (3) That made in 1871 with Great Britain for the settlement of all causes of difference. (4) That of 1922: see next article.

**Washington Conference (1921).** With the defeat of Germany after the First World War naval rivalry seemed dead. But both Japan and U.S.A. had adopted huge building programmes which con-

tinued after the war and, in view of this fact, Britain announced that it had adopted a one-power standard and that four new battleships of 48,000 tons displacement were to be built. So naval competition was once more manifest, and the situation was rendered more delicate by evident Amer. dislike of the Anglo-Jap. alliance. In order both to arrest this competition and seek a more satisfactory relationship in the Pacific, President Harding took the initiative and, on 11th Aug., 1921, invited the Brit., Jap., Fr., and Italian govts. to a conference at Washington to discuss not only the limitation of naval armaments but also general questions relating to the Far E. The Treaty subsequently signed on 6th Feb., 1922, put a stop to naval competition by stabilising the battleship strength of the five Powers in an agreement to a tentative 10 year building holiday; limiting both the maximum individual tonnage of, and the maximum calibre of gun which could be mounted in capital ships, aircraft carriers, and cruisers respectively. To satisfy Japan's desire for security, it was agreed that none of the Powers should augment the defences of their outlying possessions in the Pacific which meant that, while Japan was forbidden to fortify the mandated is., America could not strengthen the Philippine bases nor those of Guam. With this agreement satisfactorily concluded, the Anglo-Jap alliance was allowed to lapse. Finally, it was prescribed that a further conference was to be held in 1930 by which time all parties had reasons for desiring a new treaty. (See LONDON NAVAL TREATY, 1930).

**Washita**, see QUACHTA.

**Wasp**, winged, stinging, predacious insect of the genus *hymenoptera*, thousands of species of which are distributed throughout the world. In Britain, seven species of the *Vespidæ*, which are social, and the *Eumenes* and *Odynerus*, solitary, predominate among the 290 or more species. On a single occasion a male *W.* fecundates the queen *W.* with sperms, the mating taking place on the wing. The queen can then lay sperm-impregnated eggs to produce workers or other queens, or non-impregnated eggs to produce males. In the autumn, the males and workers die, and the queen hibernates in a sheltered place until she revives to found a new colony in the spring. The eggs laid by the queen *Ws.* hatch, and the growing larvæ feed on insects; then, sealed in cells or cocoons, after four to six weeks, transformed into young *Ws.* they bite their way out. The *vespa vulgaris* (social), the common yellow-black banded *W.* seen about hrlt. homes and gardens, causes intense pain from venom when it stings. In the spring, the queens build nests in the earth which are completed by the workers as they develop, using sound, weathered wood from posts and trees, chewed to pulp, for their building material. Extending downwards from a covering layer, and suspended from pillars horizontal combs of

vertical, hexagonal cells are built as required in layers. Each oviposited egg is stuck in the inverted cell to prevent its falling out, and insects are fed to the hatched-out grub until it fills the cell. Two or three hundred *Ws.*, one queen, many workers, and fewer males live in each colony. The solitary queen *W.* paralyses a caterpillar by stinging, then lays or suspends an egg in a hole burrowed in the earth, a wall, post, or plant stem, beside the helpless grub which provides food for the one hatched and growing larva. It is the custom for solitary *Ws.* to make single nests in small groups. Most *Ws.* store honey and pollen in cells as food, and, as they collect nectar and pollen, pollinate fruits and flowers; they feed also on the juices of many ripe fruits. One of the many species of solitary *Ws.*, the *Pompilidæ*, store their food cells with spiders. *Ws.* are not pests; they reduce garden insect foes, but may become a nuisance. A *W.*'s nest may be destroyed by dissolving 1 lb. of potassium cyanide, a deadly poison, in boiling water; cotton-wool should be saturated with this solution, and, with a pointed stick, plugged into the entrance to the nest; after an hour the nest may be dug out. See A. D. Imms, *Insect Natural History*, 1947; and J. Crompton, *The Hunting Wasp*, 1948.

**Wassail** (A-S. *was* and *hal*, be thou whole, of good health), originally an expression of good wishes at festivities, especially a 'toasting' or salutation in drinking. Later it was used for a drinking-bout or carouse, and then for the beverage used (especially at Christmas and New Year).

**Wassermann Reaction**, so called after the Ger. bacteriologist August von Wassermann (1866-1925), who discovered in collaboration with others a reliable biochemical method of diagnosing syphilis in the blood serum and spinal fluid. This discovery has proved to be of immense value to the medical profession in the treatment, cure, and prevention of the disease.

**Waste**, in law a term denoting any spoil or destruction done or permitted by the tenant to houses, woods, lands, or other corporeal hereditaments (*q.v.*) during the continuance of his particular estate (*q.v.*) therein. See also TIMBER.

**Waste Lands**, see LAND RECLAMATION.

**Waste Products**, see REFUSE, DISPOSAL OF.

**Watch**, on board ship, one of the two parts (starboard and port *Ws.*) into which the crew is divided for the purpose of taking duty alternately. The term is also applied to the periods of duty worked. The night is divided into three *Ws.*, from 8 to 12, first *W.*, from 12 to 4, middle *W.*, from 4 to 8, morning *W.* The day has four *Ws.*, forenoon, 8 to midday, afternoon, midday to 4, and the 'dog-watches,' 4 to 6, and 6 to 8, whose purpose is to change the turn. The list of men appointed to watch is known as the 'watch-bill.' Time is shown by the striking of the 'watch-bell,' which is struck once for every half-hour. Thus

12.30 a.m. is one bell in the middle W., and 3 a.m. is six bells.

**Watches**, see **HOROLOGY**, *Watches*.

**Watchet**, urban dist. and port of Somerset, England, on the Bristol Channel, 17 m. N.W. of Taunton. The tn. dates back to A.-S. times. There are paper mills. Pop. 2,500.

**Water**. W. covers 72 per cent of the surface of the globe and occupies depressions greater than the land above sea-level could fill. It solidifies and evaporates at normal earth temps., and in the state of vapour forms a minute but extremely important constituent of the atmosphere. It freezes at 0° C., 32° F., and boils under 760 mm. mercury at 100° C., 212° F. On freezing it expands by  $\frac{1}{9}$  its bulk; 1 c.cm. weighs 1 gram at 4° C., 39.2° F., or 1 cub. ft. weighs 62.428 lb., its greatest density, and it forms the unit of specific gravity. At 62° F. it is 8.15 times the weight of air, which in the ordinary state contains about 4 grains of W. per cubic foot. Seven-eighths of the animal body is composed of W.

Chemically, it is composed of 2 volumes of H (hydrogen) to 1 of O (oxygen), the proportions by weight being 1 : 8. It may be prepared by exploding a mixture of those gases in proper proportion, or by burning one in the other. The combustion of most H compounds is accompanied by the formation of W. W. is, when pure, a faint greenish-blue and odourless; it is very slightly compressible, and a bad conductor of heat and electricity. It has the highest specific heat of any substance known, and is thus the best cooler through a given range of temp.; 79.74 g. cal. per gram of ice (the latent heat of fusion) are required to turn ice into W., while 539.1 g. cal. per gram of W. (the latent heat of evaporation) are required to convert it into steam. In the reverse changes of solidification or liquefaction exactly the same quantities of heat are evolved. Chemically, W. is neutral, forming acids with anhydrides. Its solvent action on many substances renders it very active, and brings about reactions between dissolved substances; with some of these it forms hydrates, with others it enters into their crystal growth as W. of crystallisation. Potassium, sodium, and some other metals decompose it. It is generally held that the earliest forms of life occurred in W. Its change of form and mobility has immense effects on the earth, distributing the sun's heat, shielding the land from excessive temps., and eroding the land surface. The pressure it exerts on freezing, not less than 30,000 lb. per sq. in., bursts iron pipes and disintegrates rocks. Its purest natural form is rain, which, however, contains dust and gases dissolved from the atmosphere. It exerts a solvent effect on many rocks and enters into their crystalline structure; by virtue of its solvent action on CO<sub>2</sub> in the atmosphere, this effect is increased, and all natural Ws. contain matters in solution. (For composition of oceanic Ws., see **OCEAN**.) Calcium and magnesium bicarbonates, calcium chloride, and sulphate

are the cause of hard W. The dissolved air in all natural W. is indispensable for life in W. The presence of air and salts is beneficial in W. for domestic use; the presence of organic matter is injurious; for drinking, W. should have no solvent action on the lead pipes, or contain much magnesium salt, nor should it be soft. The presence of organic matter allows W. to be the home of injurious germs, and it is thus the cause of spreading disease. It is usual to analyse W. chemically and bacteriologically. Filtering is useful chiefly as holding back organic remains; boiling renders it much more harmless, if not totally so, only a few probably harmless spores being able to resist the temp. Drinking-W. is often sterilised by treatment with chlorine, the excess chlorine being afterwards removed by addition of ammonia or filtration through active carbon.

See J. P. Partington, *Composition of Water*, 1928. See also **WATER MEASUREMENTS**; **WATER-SOFTENING**; **WATER SUPPLY**.

**Water-beetles**, see **DYTISCIDÆ**.

**Water-Boatman**, see **BOAT-FLY**.

**Waterbuck**, see under **ANTELOPE**.

**Waterbury**, city of New Haven co., Connecticut, U.S.A., on Naugatuck R., 18 m. N.N.W. of New Haven. One of the chief manufacturing cities of the State. It produces clocks and all kinds of metalware and the noted 'W. watches.' Pearl buttons, lamps, chemicals, knitted goods, and boots and shoes are also manufactured. W. is the centre of the brass industry. Pop. 99,300.

**Water-clock**, see **CLIPSYDRA**.

**Water-colours**, pigments transferred from the cakes in which they are prepared to the paper or other painting-surface by suspension in water. The various colours are sometimes supplied in hard cakes, in which case they have to be ground by rubbing on a palette and mixed with water to the desired consistency. A convenient form is that of fairly soft cakes in china pans prepared by mixing the colour substance with a slowly drying gum. Another popular form is prepared by adding a small quantity of glycerine, which results in a moist colour suitable for storage in collapsible tubes. Variations of tint are obtained in the case of opaque pigments by mixing the colours in the right proportions. With transparent colours, beautiful effects are obtained by superimposing thin washes.

In the eighteenth century water-colour painting became a separate art, developing from the tinted drawings of the period. It has become a peculiarly Eng. art, possibly because it is especially suited to landscape and is an admirable medium to render atmospheric effects. Gainsborough used the medium, and Sandby and the Cozens, father and son, are among the earliest of Eng. water-colour painters. Those of the greatest importance who lived at the end of the eighteenth century are John Sell Cotman, one of the best of the Norwich School, and distinguished by his broad treatment of masses, J. Crome, also of the Norwich School, T. Girtin, P. de Wint, Turner,

master of atmosphere, who successfully combined various methods of water-colour painting, Constable, D. Cox, F. Towne, J. Varley, R. Bonington, and also, but separated by his individual subject-matter, Wm. Blake. At the end of the nineteenth century water-colour painting declined, becoming over-burdened with detail, but in the twentieth century the art has recovered its vitality in the work of Sargent, Steer, Rich, T. Innes, Paul Nash, Edward Bawden, Eric Ravilious, Wyndham Lewis, John Piper and members of the Euston Road group. *Gouache*, a method of water-colour painting with opaque colours mixed with gum and honey has been used by many contemporary artists including Edward Burra and Michael Ayrton. A Royal Society of Painters in Water-colours was founded in 1804. *See* E. B. Lintolt, *The Art of Water-colour Painting*, 1926; H. M. Cundall, *History of British Water-colour Painting*, 1929; L. Richmond and J. Littlejohns, *The Technique of Water-colour Painting*, 1931, 1948; and L. Baynon, *English Water Colours*, 1944.

**Water-cress**, *see* CRESS.

**Water-culture**, *see* HYDROPONICS.

**Water Cure**, *see* HYDROTHERAPY.

**Water Divining**, *see* under DIVINING ROP.

**Water-dropwort**, *see* under DROPWORT.

**Waterfalls** are typical of regions where streams are young or immature, not having had time to grade their courses. Tributaries gathering less water often fall into rivs. of larger volume, erosive action being less in the former. Falls are numerous where coastal plains of a younger type and poorly resistant strata are crossed by older rivs.; a *fall-line* exists along the inner margin of the coastal plain adjoining the older land. Most W., however, are due to riv. crossing strata at the outcrops, of different degrees of resistance, the valley in softer rock being deeper than that in the harder. In auct. glaciated regions rivs. often fall over hard strata which have been buried. W. work themselves backward through the hard rock, chiefly by undermining at the base; in the case of the Niagara and Zambesi, narrow gorges with dangerous currents occur between the present and original sites of the falls. Some of the most picturesque W. are formed by springs issuing from cliff-walls in mountainous regions. Among famous W. are Niagara; Victoria, Rhodesia; Yosemite, California; Sutherland, New Zealand; the Staubbach, Alps; Iguaçu, Argentina; Kaletneur, Brit. Guiana; Tequendama, Colombia. W. have been used to generate power by means of water-wheels for centuries past; turbines are replacing them and are particularly used for generating electricity. (*See* also HYDRO-ELECTRIC POWER.)

**Water-fleas**, *see* CLADOCERA.

**Waterford**: 1. Co. in Munster, Eire, bounded on the N. by Kilkenny and Tipperary, S. by the Atlantic, E. by Waterford Harbour and Wexford, and W. by Cork. The coastline is much indented, the prin. inlets being W. Har-

bour, Tramore Bay, Dungarvan Harbour, Ardmore Bay, and Youghal Harbour. The dists. to the N. and N.W. are mountainous, the chief ranges being the Comeragh and Monavallagh Mts. (2597 ft.), the Knockmealdown Mts. (2605 ft.), and the Drum Hills (990 ft.) in the S.W. The prin. rivs. are the Suir and the Blackwater, famous for the salmon fishing. Agriculture is successfully carried on, but the greatest area is under pasture, and the rearing of livestock is important. The fisheries form one of the chief industries, and there are breweries, distilleries, and flour mills. Marble and copper are found. The chief tns. are W., Dungarvan, and Lismore. The co. returns four members to the Dail Eireann. W. was, in the tenth century, inhabited by the Danes, of whom there are numerous relics. At Lismore there is a historic castle, the Irish seat of the duke of Devonshire, at Ardmore seventh-century monastic remains and a holy well, and at Mellray there is a Trappist monastery (1830). Area 713 sq. m. Pop. 104,500.

2. Municipal parl. and co. bor., and city, cap. of co. Waterford, Eire, on the lt. Suir. A modern bridge connects it with the suburb of Ferrybank on the N. bank of the riv. It contains Protestant and Rom. Catholic cathedrals. Fragments of the old city walls remain, notably Reginald's Tower, dating from the eleventh century. A large export trade is carried on, especially in bacon, butter, and cattle. Iron-working, ship-building, flour-milling, brewing, and bacon-curing are carried on. The harbour is formed by the estuary of the Suir and Barrow. There is steamer communication with Fishguard, Glasgow, Liverpool, Bristol, etc., besides the other Irish ports, among which it ranks second. W. was wrested from the Danes by Strongbow in 1171. Prince John landed there in 1185, and afterwards as king in 1210. Richard II. landed there in 1394 and 1399. James II. sailed from Duncannon Fort on the Wexford side of W. harbour for France after the Battle of the Boyne, and William sailed from there to England. During the Civil war it was taken by Ireton. It received its first charter from King John in 1206. Pop. 27,900.

**Water Glass**, *see* under GAS MANUFACTURE.

**Water Glass**, *see* SOLUBLE GLASS.

**Water Hemisphere**, *see* under OCEAN AND OCEANOGRAPHY.

**Water Hemlock, Cowbane, or Dropwort**, (*Oenanthe crocata*), tall umbelliferous perennial growing in damp places bearing large umbels of white flowers. Its turnip-shaped root is poisonous.

**Waterhen, or Moorhen** (*Gallinula chloropus*), common bird of the order Itardæ (rails), frequenting slow rivs., streams, lakes, and ponds, and though not web-footed an active diver and swimmer. Though black and white apparently from a distance, the plumage has many hues. The nest is built by the waterside, and the eggs are reddish-white with orange-brown spots.

**Water-lily**, name given to the various

species of *Nymphaea* and *Nuphar* and also of *Nelumbium*, all belonging to the family *Nymphaeaceae*. Britain produces white (*Nymphaea alba*) and yellow (*Nuphar luteum*) Ws., which are found floating in still waters.

**Waterloo**, vil. situated 9 m. S. of Brussels, chosen by the duke of Wellington, from its strategic position relatively to the line of fortresses on the N.E. frontier of France, as the most advantageous place to resist the advance of Napoleon on the Belgian cap. in 1815. Napoleon crossed the Belgian frontier and fighting began on the 16th, as the Prussians contested his advance to gain time for the concentration of the main Allied forces. Simultaneously engagements at Liguy and at Quatre Bras followed Napoleon's decision to attack the Allies separately. Neither was decisive, largely owing to the contradictory orders which caused D'Erlon's corps to take part in neither. The Prussians then retreated, but to the N., and not to the E. in which direction lay their line of communications; this was to have an important result, since Napoleon's aim was to defeat Wellington before Blücher could join him. Detaching Grouchy to follow the Prussians, Napoleon advanced with his main body on Wellington's defensive position at W., which Ney had allowed him to reach unmolested. The duke learned during the night of June 18-19 that Blücher could support him, and determined to stand and fight. His forces consisted of 49,608 infantry, 12,402 cavalry, 5645 artillery with 156 guns (of which total, scarcely 24,000 were Brit.). Napoleon had 48,950 infantry, 15,765 cavalry, 7232 artillery with 246 guns.

Wellington took up a characteristic defensive position, using a low ridge as a screen for his main body. The Guards occupied the outlying farm of Hougoumont on the right, and the King's German Legion that of La Haye Sainte in the centre. The battle opened at 11.30 a.m. with a Fr. attack on Hougoumont; Napoleon's decision to break his enemy's centre instead of turning his left removed the last hope of separating the Allies. At 1.30 p.m. Bulow's corps were seen advancing, and a force was sent to hold them off; thus the effect of Blücher's manoeuvres was early felt. An attack was launched on Wellington's centre, and on La Haye Sainte. A Dutch-Belgian brigade broke, but no decisive effect was produced, and a charge of the 'Union' cavalry brigade (Royals, Scots Greys, and Inniskillings) swept away the Fr. infantry before itself being driven back. Another attack on La Haye Sainte failed, and a heavy artillery fire was opened. Fr. cavalry charges then broke against the infantry squares. About 4.30 p.m. further Fr. forces, including the Young Guard, were sent against Bulow, who was temporarily forced back. About 6 p.m. the remnants of D'Erlon's corps succeeded in capturing La Haye Sainte, but Wellington reformed his line, being enabled to reinforce his weakened centre by the advance of Zieten's Prussians towards

his left. Napoleon then launched another general attack, including his Guard, but was repulsed. As the Guard fell back at 8 p.m. Zieten broke into the N.-E. sector of the Fr. line; Wellington set his whole force moving and the Fr. army disintegrated, the Prussians taking up the pursuit. The casualties were heavy; the Fr. lost over 40,000, and the Prussians 7000, and Wellington over 15,000. See K. von Clausewitz, *Campaigne de 1815*, (1835, Fr. trans. 1899); J. St. Kennedy, *Battle of Waterloo*, 1865; Sir E. Creasy, *The Fifteen Decisive Battles of the World*, 1887; A. F. Becke, *Napoleon and Waterloo*, 1914; and Wellington, *Dispatches and Memorandum on Waterloo* (ed.), 1844-47.

**Waterloo**: 1 Co. seat of Black Hawk co., Iowa, U.S.A., on Cedar R., 52 m. from Cedar Rapids. 6 m. from Cedar Falls. Agriculture, dairying, and poultry-raising are the chief pursuits. There are foundries, canning and packing industries, and various manufs., especially of farm implements, tractors, and separators, and railway workshops. There are good water power and electric power plants. Pop. 51,700. 2. Municipality of New S. Wales, Australia, a suburb of Sydney (2½ m. distant). Pop. 9,500.

**Waterloo Bridge**. The original nine-arched bridge between Blackfriars Bridge and Charing Cross was built by Sir John Rennie (who also built London Bridge) 1811-17. It was the oldest existent London bridge crossing the Thames before being demolished and replaced by a new bridge designed by Sir Giles Gilbert Scott, and opened in 1944.

**Waterloo Cup**, The, see under COURSEING. **Waterloo-with-Seaforth**, part of the bor. of Crosby, once an urb. dist., of Lancashire, England, on the Irish Sea, at the Mersey's mouth, a residential suburb (N.W.) of Liverpool (5 m. distant).

**Watermaal-Boschvoorde** (Flemish **Watermaal-Boschvoorde**), tn. in Brabant, Belgium, forming a S.E. suburb of Brussels, in garden city style, at the edge of the forest of Soignes. Pop. 19,600.

**Water-mark**, design impressed into paper (*q.v.*), first invented at Fabriano in Italy. At the last stage of the progress of the pulp over the wire gauze a copper wire cylinder, called the 'dandy roll,' carrying the design, impresses this into the pulp, producing the W.-m.

**Water Measurement**. The flow of water is measured by various methods each of which is applied according to the volume of water to be measured and the circumstances. The most accurate measurement is by recording the time taken to fill a vessel or tank of known proportions; this, however, is not always practicable. Very large flows of water, *e.g.* in rivers, can be measured with moderate accuracy by finding the average velocity in a section of channel of known cross-sectional area. The velocities are measured by recording the movement of floats, or by the use of current metres. As the velocity is higher at the surface and in the centre than near the bottom or sides of the stream, recordings have to be taken in sev. positions and averaged.

Flows can be estimated, roughly in the case of rivs. or with fair accuracy in the case of pipes or channels constructed of certain classes of materials, by recording the hydraulic gradient, or loss of head due to friction per unit length, and calculating the flow in accordance with various formulae. Crimp and Bruges's and Manning's formulae have, perhaps, been most frequently employed in engineering practice, while more recent formulae take the form

$$V = K m^a i^{\beta}$$

where:  $V$  = velocity in ft. per sec.;  $m$  = hydraulic mean depth, i.e. cross-sectional area of flow divided by wetted perimeter, in ft.; and  $i$  = the fall divided by the length. The values of the constant  $K$  and of the indices  $a$  and  $\beta$  all vary according to the material of which the pipe, culvert or channel is constructed.

Of these, which generally have the virtue of being most in conformity with the experimental data, Barnes's formula for new asphalted cast-iron pipes,  $V = 174.1 m^{0.789} i^{0.535}$  is probably the most accurate.

Where practicable, flows in rivs. and open channels are measured by recording the depth of flow over weirs of known proportions. Sev. types of weir are used, including V-shaped, rectangular and trapezoidal weirs constructed of sharp-edged metal plates; suppressed weirs consisting of a sharp-edged plate arranged across vertical-sided channels; and simple broad-crested sills such as brick, masonry or concrete walls. Precautions have to be taken that the velocity of approach to a weir is not excessive, otherwise recordings will be inaccurate. Accurate measurements of head over a weir are made with the aid of a hook-gauge, which is a hook so arranged that its point approaches the surface of the water upwards. When the point of the hook breaks the surface, this becomes immediately obvious and the level of the point, relative to crest of weir, is read on a vernier scale. Flows are also recorded graphically by floats which actuate clock-controlled instruments. Flows of water containing heavy silts are best measured through standing-wave flumes, which are constrictions in open channels. The formula applicable to flat-crested weirs serves also for these.

The following formulae have been agreed and embodied in Brit. Standard Specifications as being sufficiently accurate for the purpose of testing the performance of pumps:

90° V-notch:  $Q = 2.48 H^{3/2}$

Suppressed rectangular weir:

$$Q = L (3.23 + 0.434 \frac{H}{P}) (H + 0.0034)^{3/2}$$

Contracted rectangular weir:

$Q = 3.29 (L - 0.1 H) H^{3/2}$  where  $Q$  = discharge in cub. ft. per sec.;  $H$  = observed head over weir in ft.;  $L$  = length of weir in ft.; and  $P$  = height in ft. of the crest above the bed of the channel of approach.

Flows through both closed pipes and open channels may be recorded by mea-

suring the loss of head through submerged orifices, the formula being:

$$Q = mA \sqrt{2gH}$$

where:  $Q$  = cub. ft. per sec.;  $H$  = head in ft. of water-level above orifice to centre of orifice, or, if water-level downstream of orifice is above centre of orifice,  $H$  is difference of upstream and downstream water-levels;  $A$  = area of orifice in ft. super;  $m$  = a constant for type of orifice.

The values of  $m$  are: for thin sharp-edged plate,  $m = 0.62$ ; short length of pipe, projecting out from a tank, having a length of two to three times the internal diameter,  $m = 0.81$ ; narrow bridge opening,  $m = 0.82$ ; narrow opening flush with bottom of tank,  $m = 0.86$ ; wide bridge opening,  $m = 0.92$ ; wide openings with inverts flush with invert of tank, and large sluices with flush side walls, or bridges with cut-waters,  $m = 0.96$ .

Velocity in pipes or channels can be recorded by the use of Pitot tubes, which are small-diameter tubes arranged with their ends to face the flow so as to convert velocity head into pressure head. Nozzles incorporating Pitot tubes are often used by fire brigades for recording the discharges of hydrants.

The Venturi Meter is an instrument applicable to the measurement of moderately large flows through pipes. It consists of a constriction in the line of pipe which causes a local increase of velocity and corresponding reduction of pressure. Pressure is measured above the constriction and at the constriction. The Brit. Standard formula for computing the flow reads:

$$Q = 0.557 aC \sqrt{\frac{H}{n^2 - 1}} \quad \text{where } Q =$$

discharge in cubic ft. per sec.;  $a$  = area of the upstream entrance to the meter in sq. in.;  $C$  = coefficient of discharge (approximately 0.98);  $H$  = differential head in ft. of water;  $n$  = area of Venturi tube at upstream =  $\left(\frac{D^2}{D_1^2}\right)$

area of throat  
where  $D_1$  = upstream diameter, and  
 $D$  = throat diameter

When required to be measured, supplies of water, e.g. to premises, are usually recorded by meters either of the inferential or positive types. In each case the total flow 'to date' is recorded on a dial. An inferential meter consists of a small turbine which is driven at varying rates according to the rate of flow; it is liable to be inaccurate at very small flows. A positive meter involves a piston moving in a cylinder, the number of strokes of the piston being in direct relation to the quantity of water displaced. See also HYDROKINETICS. See A. A. Barnes, *Hydraulic Flow Reviewed*, 1916; F. C. Lea, *Hydraulics*, 1926; *British Standard Specification No. 722 for Borehole and Well Pump Tests*, 1937; *British Standard Specification No. 723 for Sewage Pump Tests*, 1937; E. Dixon Grubb, *Simple Hydraulics for Firemen*, 1941; S. Crimp

and W. E. Bruges, *Tables and Diagrams for Designing Sewers and Water Mains*, 1949; and *The Contractors' Record Hydraulic Diagrams 1 and 2*, 1949.

**Water Melon**, or *Citrullus vulgaris*, plant (family Cucurbitaceae) with yellow flowers followed by large round fruits which are cultivated in tropical countries and sometimes grown in greenhouses in Britain. In the U.S.A. the W. M. is an important crop in the S. States. The fruit, which has a green rind, often grows to 2 ft. in length, and when ripe the meat inside is a rosy red and very sweet, particularly when iced.

**Water on the Brain**, see HYDRO-CEPHALUS.

**Water-Ousel**, see DIPPER.

**Water-parting**, see WATERSHED.

**Water Plants**, see AQUATIC PLANTS.

**Water Polo**, game which originated in England about 1880 and is now played universally. There are seven players in each team—a goalkeeper, two backs, one half-back, and three forwards who endeavour to score goals by throwing a ball (like a football in size and construction) into their opponents' goal.

The governing body of the game is the Amateur Swimming Association and the game is played in swimming pools which will accommodate a playing pitch with the following dimensions: length, minimum 20 yds., maximum 30 yds.; width, minimum 8 yds., maximum 20 yds.; depth, minimum 3 ft.; distance between goalposts 10 ft.; crossbar in deep water, 3 ft. above water surface; crossbar in shallow water, 8 ft. from floor of playing space.

The duration of each game is 35 min., divided into halves of 15 min. with a five min. interval. It is controlled by a referee on the bath side.

**Waterproof Compositions.** Since the middle of the nineteenth century many methods have been used for rendering fabrics waterproof, and the first oil-proofers were probably fishermen who made for themselves coats of canvas or other strong materials, to which they applied sev. liberal coatings of crude linseed oil, waiting sev. months for each application to dry. This process took anything up to eighteen months to complete. In recent times the demand for both industrial and domestic use has necessitated considerable scientific research and the introduction of mechanically operated machinery for producing many kinds of waterproof materials. The application of oil varnish is mostly done on 'coating towers', the fabric passing over rollers into baths containing the impregnating liquid and then passing through heated ovens to dry, thus eliminating such solvents as may have been used. Impregnating or waterproofing compositions are made for many different purposes, but oil varnish is largely used, being made from such oils as linseed, tung oil, and dehydrated castor oil with the appropriate resins to which industrial solvents and driers, usually metallic naphthenates, are added and are termed 'stoving varnishes.' Many natural resins are used, i.e. Copals, but

these have been to some extent superseded by Ester gums and synthetic phenolic and formaldehyde resins, whilst in addition, coating can be carried out in a similar manner to that described by the use of entirely synthetic resins in liquid form to which are added the necessary plasticisers and suitable solvents and 'wetting' agents. There are many formulae now in use, and in addition, waterproof compounds can be applied to prevent material such as heavy canvas duck, from rotting and render it flame resistant. These heavier cloths are used extensively for vehicle covers and agric. purposes. Rubber proofing of textiles has become a very important industry.

**Water Scorpion**, hemipterous insect or bug (*Nepa cinerea*) found in ponds and stagnant waters in Britain. It has curved forelegs and a tail-like appendage or breathing tube to the abdomen which give it somewhat the appearance of a scorpion.

**Water-rail**, see RAIL.

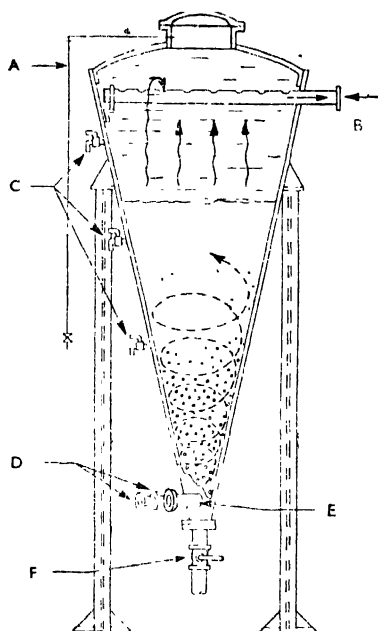
**Water Rights**, see RIVERS, *Law Relating to Rivers*; *Riparian Rights*. See also PUBLIC HEALTH; TERRITORIAL WATERS; and WATER SUPPLY.

**Watershed**, **Water-parting**, or **Divide**, in physical geography, the whole region which is drained by or contributes to the supply of a riv. or lake. Also the line of separation between the basins of two adjacent rivs., lakes, or drainage-valleys, or the natural boundary of a basin, from which streams flow in opposite directions. **'Water-Snake'**, see HYDRA (constellation).

**Water-softening.** Hardness of water is due to the presence of calcium sulphate, and the bicarbonate of calcium and magnesium (the latter being responsible for temporary hardness which can be removed by boiling); thus they do not lather with soap, which is decomposed, and insoluble salts of calcium and magnesium are formed with the fatty acids. In addition the formation of 'fur' or scale in boilers and kettles by deposition of soluble matters is a great disadvantage. The methods for rendering hard water soft are (1) by the addition of washing soda or of ammonia. In this way calcium carbonate is deposited,  $\text{CaSO}_4 + \text{Na}_2\text{CO}_3 = \text{CaCO}_3 \downarrow + \text{Na}_2\text{SO}_4$ ,  $\text{Ca}(\text{HCO}_3)_2 + 2\text{NH}_4\text{OH} = (\text{NH}_4)_2\text{CO}_3 + \text{CaCO}_3 \downarrow + 2\text{H}_2\text{O}$ . This method is often employed in the household. (2) By the addition of the requisite amount of milk of lime which removes temporary hardness,  $\text{Ca}(\text{HCO}_3)_2 + \text{Ca}(\text{OH})_2 = 2\text{CaCO}_3 \downarrow + 2\text{H}_2\text{O}$ . The precipitate is allowed to settle. This does not remove the sulphate; for this purpose sodium carbonate is added, the Ca being precipitated as carbonate, the sodium sulphate formed being soluble and innocuous. It is usual to supply the lime in defect rather than in excess, though a slight excess is claimed to have bactericidal effect. Commercially, the process is carried out by adding a controlled amount of lime and soda emulsion to the hard water, allowing the mixture to settle in a reaction tank, and filtering the resultant softened water to eliminate



traces of precipitate which are not removed by settlement. In the Precipitator type of lime soda softener, hardness removal is achieved by allowing the water to flow upwards through a zone of precipitate retained in hydraulic suspension: this method produces a clear softened water which often requires no



WATER-SOFTENER: 'PERMUTT' SPIRATOR

A, air vent; B, softened water outlet; C, test cocks; D, chemical inlets; E, raw water inlet; F, draw-off valve for enlarged catalyst

additional filtration. In the 'Spiractor' pressure lime softener, the precipitated calcium carbonate is induced to crystallise on grains of catalyst, the particular advantage being that all precipitate forms in hard, easily handled granules instead of as bulky wet salt. (3) By the base exchange process. A base exchange water softener consists of a closed steel vessel containing granular base exchange material through which the hard water is passed. This base exchange material has the property of absorbing the calcium and magnesium hardness salts from the water and of exchanging them for an equivalent amount of harmless soda salts. This softening action continues until the base exchange material contains no more exchangeable sodium: when this stage is reached, the softener is regenerated by flushing with a small amount of solution of common salt (NaCl). During regenera-

tion, soda from the brine is taken up by the base exchange material, and the calcium and magnesium previously absorbed are rinsed away to the drain.

**Water Spout, Irish, see under SPANIEL.**  
**Water-spout**, funnel cloud very similar to a tornado (*q.v.*), except that it occurs at sea and is normally not quite so violent. It is formed in a similar way to the tornado beneath a cumulonimbus cloud in the transition zone between warm moist and dry air masses although it can occur without a change of air mass in convectively unstable air that has absorbed in the lower layers large quantities of moisture from warm seas. The instability is increased by the cooling of under-running dry air by evaporation into it of rain from above. The funnel of the W. may be of any diameter from 20 ft. to 200-300 ft. and raises a small cloud of spray where it meets the sea. The life of a W. is rarely more than half an hr.

**Water Supply.** Water has always been considered one of the prime necessities of life. The Rom. aqueducts and baths are unsurpassed in splendour, but they are an isolated phenomenon. Hot baths were introduced from the E. and communal bath-houses were in use on the Continent throughout the Middle Ages. Bath-houses were built in England at country mansions about 1660, indoor baths began to be installed, and in 1778 Joseph Bramah patented the modern form of water closet.

But recognition of the importance of cleanliness as a preventive, and of contamination of water as carrier of disease had to await the discoveries of Lister and Pasteur, and the provision of ample supply of wholesome water became possible only after the development of bacteriological technique. The outbreak of cholera in 1831-3 directed public attention to the question of water pollution and in 1842 a parl. commission was appointed to inquire into the state of W. Ss. Of 50 large tns. examined, 6 were found to possess good W. S., in 13 it was indifferent, in 31 inadequate or impure. In Birmingham 4 out of 5 houses, in Newcastle 11 out of 12, had no water. After the third cholera epidemic (1866-6) a Royal Commission was set up to investigate the state of public health and pronounced the supply of pure water necessary 'for civilised social life.' It is Disraeli's Public Health Act (1895) and Joseph Chamberlain's work during his mayoralty of Birmingham (1873-76) which mark the beginning of modern improvements in sanitation, putting public health in the forefront of State responsibilities and making it incumbent on public authorities to see that every dwelling-house has an adequate supply of wholesome water within reasonable distance. In Great Britain, 70 per cent of the pop. obtained their W. S. from public authorities, 15 per cent from private companies and 15 per cent from local wells or other sources (1950).

**Quantities.**—The quantity of water consumed per head of pop. varies considerably, from less than 5 gallons per

head of pop. per day in some outlying localities, to over 100 gallons in parts of Scotland. In America, demands of more than 100 gallons per head per day are not uncommon. In Great Britain, the demand is most often in the region of 25 gallons per head per day for domestic purposes only, and 30 gallons per head per day including trade demands. These figures make no allowance for the private supplies owned by many factories. In the design of new W. S. systems, it is usual to allow 12½ gallons per head per day for vills., 25 gallons for country tns. and residential areas, and 30 gallons upwards for larger tns.

*Sources of Supply.*—Supplies of water for domestic and other purposes are obtained from either surface or underground sources. Surface sources, which include the run-off of upland catchments, intake from rivs., and natural lakes, and collection from artificial impervious areas (e.g. roofs), usually afford waters which are soft, i.e. containing little dissolved mineral matter. Underground sources from springs and deep wells are liable to be hard. Riv. waters, shallow wells, and some springs are liable to organic and bacteriological pollution. In Great Britain, the majority of upland catchments are in the N. and W. areas where the geology is such that it renders collection of surface run-off and storage in impounding reservoirs comparatively easy. Wells are more common in the E. and S.E. owing to the prevalence in those regions of water-bearing strata. The type of source to be selected depends on the value of the available sources, their positions, and the quantity of water required. Very large supplies are usually taken from catchments, either upland or lowland; wells will serve for small supplies and for some tns., but an individual well will seldom give an adequate supply for a large pop. Thus, supplies to small communities are local, but supplies for large tns. may be brought from considerable distances.

The distribution of water in the strata of England may be generalised as follows. The clays, gault, Upper Lias, and New Red Marl are non-water bearing; limited supplies are obtained from Purbeck Beds and Lower Lias; from the gravels, crags, and sands the water is subject to pollution and often contains iron, but good supplies are obtainable from the Reading Beds and Thanet sands. Chalk, Upper and Lower Greensand afford a practically unlimited supply of good, pure, but hard water, which applies also to calcareous grit, oolites, magnesian limestone, and mt. limestone. Good supplies are obtained from Portland rock, Middle Lias, New Red Sandstone, Old Red Sandstone, slate, and granite. Millstone Grit gives excellent water in abundance; the coal measures also provide much.

*Water Treatment.*—Water as collected requires treatment, owing to the suspended and dissolved solids and living organisms which it contains. The first process of treatment is usually sedimentation, to remove suspended matter, and in some cases this may be combined with the

water-softening process. Remaining sediment, including a large proportion of the bacteria present, is removed by filtration. The method which is known as slow sand filtration is being largely superseded by the use of mechanical filters or pressure filters, which are closed steel vessels containing the filter medium. The water, dosed with coagulant, enters the shell at the top and passes downwards through the graded medium at a rate of filtration often as high as 100 gallons per sq. ft. per hr. The filter is cleaned periodically by agitation or injection of compressed air.

Sedimentation and filtration remove suspended solids and an appreciable proportion of the bacteria present in the raw water. Dissolved solids are removed by softening processes. (See WATER SOFTENING.) It is now usual to render all waters bacteriologically sterile by the application of chlorine, chlorine and ammonia (chloramine process) or, less frequently, ozone. After complete treatment water is kept in covered reservoirs so as to exclude light, which would encourage vegetable growth. This storage, which gives time for chlorine to act, usually takes place in the service reservoirs which are part of the distribution system. London has a process of super-chlorination which leaves no taste of chlorine in the water.

*Reservoirs.*—When water supplies are taken from surface sources, in particular upland catchments, storage reservoirs are necessary to overcome periods of drought. These are of very great capacity, e.g. six months water demand. (See RESERVOIRS.) When water is drawn from underground sources reliance is placed on the natural underground storage (referred to as the underground reservoir) and no reservoirs have to be constructed other than the small-capacity service reservoirs which form part of the treatment and distribution system and which hold in the region of two or three days' supply only.

*Water Distribution and Provision for Fire Fighting.*—Water distribution systems are made to take at least three times the average daily demand, in order to allow for peak demands and reduction of pipe capacity by incrustation. Water must be supplied between reasonable limits of pressure, so as to be adequate for fire fighting purposes and to reach the tops of high buildings. For fire fighting the pressure should not be less than 45 lbs. per square in. when the demand from the hydrant is about 200 gallons per min. This rough rule ensures sufficient pressure for ordinary fire fighting without the aid of a mobile pump and sufficient quantity to keep a mobile pump supplied should the latter prove necessary. On the other hand, pressure in the mains should as far as practicable be kept below 100 lbs. per sq. in. because not only do high pressures cause water-hammer and damage to household pipes and fittings, but they necessitate heavier classes of main. These limits of pressure necessitate that water shall be supplied in 'zones,' low-lying areas being served from low-level service reservoirs, and high-level areas

from high-level reservoirs. Areas are sometimes served by pumping only and pressure reduced as necessary by automatic pressure-reducing valves. Water towers are small service reservoirs erected above ground level. Water is delivered to the areas to be served by trunk mains. Properties are not served directly from these trunk mains, but by means of networks of service mains each of which connects to a trunk main at one point only. The networks of service mains are broken up into sections with the aid of a system of valves, which renders possible the isolation of short lengths for maintenance purposes. It is seldom that a main of less diameter than four in., unless of very short length, will give the aforementioned quantity and pressure for fire fighting purposes. Thus, in some dists., all distributing mains have been made four in. internal diameter or larger. Smaller sizes are used in rural areas. When new mains are proposed, the fire authority (co. or co. bor.) must be informed, and they can insist on increased dimensions and the provision of hydrants, etc. The additional cost falls on the fire authority.

Water mains consist of cast-iron pipes, or, more rarely, asbestos-cement pressure pipes, laid with at least three ft. of cover, to protect them from frost or damage. Air valves are placed at all high points on the system to release air and thereby prevent air-lock, and wash-out valves at all low points. Fire hydrants are placed at intervals not exceeding 200 yds., and closer as may be justified by the fire risk. Calculation of flow through pipes is made in accordance with sev. accepted formulae. (*See WATER MEASUREMENT.*)

**Statutory Powers.**—The power to supply water in England and Wales is vested in various bodies, namely, water companies and individuals, acting either under a local Act or a Provisional Order, or under powers given by the general law without the special powers conferred by such Act or Order; local authorities acting as or in default of water companies; joint water boards formed by uniting two or more urban or rural dists. into a united dist. for a common W. S.; and (for London), the Metropolitan Water Board (*q.v.*). Generally speaking, prior to the Public Health Act, 1936, the W. S. of rural dists. was regulated by the Public Health Act, 1875, and the Public Health (Water) Act, 1878, the supply being under the authority of the rural dist. council as the rural sanitary authority.

Under the Water Act, 1945, the minister of health is assigned the general duty of promoting the conservation and proper use of water resources and securing the effective execution by water undertakers of a national policy relating to water, and to this end he is required to appoint a central advisory committee for the purpose of advising him on these matters and on the operation of legislation concerned with W. S. To secure better W. Ss. or water conservation in given areas the minister may set up joint advisory water committees representative of water undertakers and local authorities in the

areas concerned. He is also empowered to require local authorities and statutory water undertakers to carry out surveys and formulate proposals relating to W. S. as well as to require records and information from persons abstracting water from any source.

Under the Public Health Act, 1936, the minister was enabled, on application being made to him, to create joint water boards for united dists., but this he may now do without the need for prior application. Where it is expedient for securing a more efficient W. S., the minister may make orders, operating by agreement or by compulsion, for the combination or amalgamation of water undertakers or the transfer of water undertakings. On complaint or otherwise, the minister may order an investigation to ascertain whether any local authorities, joint water boards, or statutory water undertakers, have failed to provide an adequate W. S. and in the event of sustained default on the part of a water undertaker the minister may transfer to himself or, in certain cases, to the co. council of the area, the powers of the body in default. As to conservation of water resources, all by-laws for preventing the waste or contamination of water require the confirmation of the minister and have a maximum duration of ten years. Apart from by-laws there is statutory provision making it an offence to pollute any spring if the water from it is used or likely to be used for human consumption or domestic purposes. Part IV. of the Water Act, 1945, enables the minister to make orders conferring on 'any persons who are or propose to become statutory water undertakers' authorising them to construct, alter, and maintain waterworks, to supply water in any area, and to raise capital for such purposes and to acquire land or water rights either compulsorily or by agreement. The Act imposes a duty on the undertakers of giving a W. S. on reasonable terms and conditions for non-domestic purposes, such as to farmers and industrialists, but there is a limit to this duty where its performance would prejudice existing obligations to supply water, by entailing unreasonable expenditure in constructing new waterworks. The Act also makes provision for requiring statutory water undertakers to lay water mains in advance of the development of a housing site. Other provisions in the Act enable the minister to revise water rates and charges and empower water companies to issue redeemable stock. The Rural Water Supplies and Sewerage Act, 1944, authorises the minister of health to make contributions towards the expenses incurred by local authorities on approved works in providing or improving water supplies in rural localities (and in making adequate provision for sewage disposal).

*See also* FILTERS, IRRIGATION, MUNICIPAL TRADING, PUMPS, RAINFALL, RESERVOIRS, RIVERS, SEWAGE, WATER MEASUREMENT, and WATER SOFTENING. *See* F. E. Turneaure and H. I. Russell, *Public Water Supplies*, 1924; A. P. Folwell, *Water-Supply Engineering*, 1925;

P. M. Parker, *Control of Water*, 1925; W. T. Taylor, *Practical Water Power Engineering*, 1925; J. E. Dumbleton, *The Construction of Wells and Boreholes for Water Supply*, 1928; W. K. Burton, *Water Supply of Towns*, 1929; D. M. Baker and H. Conkling, *Water Supply and Utilisation*, 1930; G. V. James, *Water Treatment*, 1949; and L. B. Eschritt and S. F. Rich, *The Work of the Sanitary Engineer*, 1949.

**Water-tight Compartments**, see SHIPS AND SHIPBUILDING.

**Watertown:** 1. Tn. of Middlesex co., Massachusetts, U.S.A., on Charles R., residential suburb of Boston, 6 m. W. There is a national arsenal; manufs. include rubber, paper, woollen goods, stoves, and motor vehicles; and horses and cattle are reared. W. was founded about 1630, since when much of its ter. has been absorbed by Cambridge. Pop. (1940) 35,400.

2. Cap. of Jefferson co., New York, U.S.A., on Black R., 47 m. from Oswego. It has a state armoury, and manufs. of paper, woodpulp, steam-engines, vehicles, cheese, and other dairy produce. There are tale and lead mines, and W. is a popular resort. Pop. (1940) 33,400.

**Waterville**, tn. of Kennebec co., Maine, U.S.A., on the Kennebec, 17 m. N.N.E. of Augusta. Fine water-power is supplied by the Ticonic Falls. Colby Baptist College (Waterville College, 1820) and the Coburn Classical Institute are here. Cottons, woollens, machinery, paper, and furniture are manufactured. Pop. 16,700.

**Watervliet**, tn. of Albany co., New York, U.S.A., on Hudson R., opposite Troy. It contains an arsenal, a national gun factory, car works, foundries, etc. Woollens and hardware are among the manufs. It was called West Troy till 1897. Pop. 16,100.

**Water Wheels**, various kinds of wheel worked by water and working machinery; or, more briefly, prime movers which utilise the potential and kinetic energy of water. In the 'overshot' and 'breast' types the working force is obtained by the direct weight of the water delivered into the wheel; in 'undershot' wheels the force is obtained by the kinetic energy of the water passing beneath; and in the Pelton (or Poncelet) wheel by a high velocity jet; while the 'turbine' includes wheels driven by impact or reaction or both of a flowing stream of water.

**Watford**, municipal bor. of Hertfordshire, England, on the Colne, 15 m. N.W. of London. A wide variety of light industries includes printing, papermaking, brewing, and watercress growing. It is a large residential dist. The par. church (twelfth century) includes the Essex Chapel. The almshouses (1590), Monmouth House (seventeenth century), Free School (1704), and Frogmore House (1715) are interesting. Aldenham, 2 m. distant has an important public school (1597). Pop. 75,000.

**Watkins, Henry George** ('Gino') (1907-32), Brit. Arctic explorer, educated at Lancing and Trinity College, Cambridge. He was interested in natural science and

was an expert Alpinist. At twenty-one he was chosen to organise a univ. expedition to Edge Is., Svalbard (Spitsbergen). In 1928 he undertook the more ambitious task of exploring and surveying the interior of Labrador. The success of this undertaking led to the formation under W. of the Brit. Arctic Air Route Expedition of 1930-31. Later W. planned an expedition across the Antarctic, but gave up for lack of funds and returned in July (1932) to Greenland, where he was drowned while seal-hunting. W. was probably the youngest man ever to receive the Founder's medal of the Royal Geographical Society (1932). See F. S. Chapman, *Northern Lights*, 1932, and *Watkins' Last Expedition*, 1934; and J. M. Scott, *Gino Watkins*, 1935.

**Wath-upon-Deane**, mrkt. tn. and urban dist. of the W. Riding of Yorkshire, England, 7 m. from Barnsley and near the Deane and Dove Canal. It lies on the S. Yorkshire coalfield, and iron is also mined. Pop. 13,700.

**Wating Street** (*Waeclinga Stræet*), one of the early Rom. highways in Britain. It ran from Dover, through Canterbury to London, and then N. past St. Albans (Verulamium) and the boundary between Leicestershire and Warwickshire to Wroxeter on the Severn, and perhaps to Chester. Branch-roads were added later, and the Kentish branches from the ports of Reculver, Richborough, Dover, and Lynnhne, focused on Canterbury, became the highway from the Channel ports to London. The road in London, crossed by Bread Street, with Wating Tavern at the corner of Bow Lane, still bears this name. See J. R. Harris, *Wating Street*, 1928.

**Watson, John Broadus** (b. 1878), see under BEHAVIOURISM.

**Watson, John** (1850-1907), Eng. minister and novelist, known as 'Ian Maclaren', b. at Manningtree in Essex and became minister of Free St. Matthew's, Glasgow, and of Sefton Park, Liverpool. He was very successful as a writer, and his description of Scottish life became very popular. He wrote sev. novels, the best-known being *Beside the Bonnie Brier Bush* (1894) and *The Days of Auld Lang Syne* (1895). See life by W. Robertson Nicoll, 1908.

**Watson, John Christian** (1867-1941), Australian statesman, b. in Valparaiso, Chile, and educated at Oamaru, New Zealand. He went to New S. Wales where he became head of the newspaper compositors' trade union. In 1894 he entered the Legislative Assembly and soon afterwards was elected leader of the Parliamentary Labour Party. In 1901 he became leader of the Federal Labour Party. W. was invited to form a Gov., the first Gov. formed by and in the interests of Labour that had ever attained to office under Brit. parl. institutions.

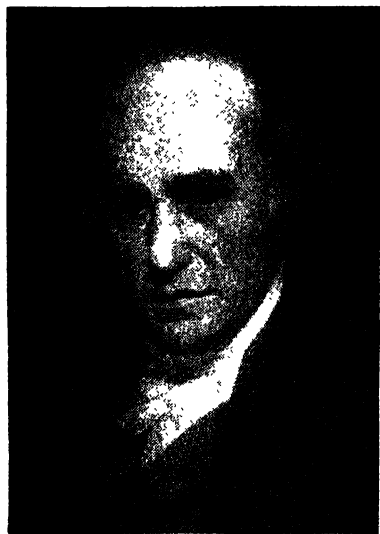
**Watson, Robert William Seton**, see SETON-WATSON.

**Watson-Watt, Sir Robert Alexander** (b. 1892), Eng. scientist and inventor, b. at Brechin, Angus; educated at the High School there, Univ. College, Dundee,

and St. Andrews Univ. After working in the Meteorological office and the Department of Scientific and Industrial Research, he was from 1933 to 1936 superintendent of the radio dept. of the National Physical Laboratory. Here, following the investigations of the Amers. Breit and Ture he estab. the science of radar (*q.v.*) as a military weapon. From 1938 to 1940 he was director of communications development at the Air Ministry. In 1940 he became scientific adviser on telecommunications at the Air Ministry, and in 1942 vice-controller of communications at the Ministry of Aircraft Production. He was knighted in 1942.

**Watson-Wentworth, Charles**, *see* ROCKINGHAM, MARQUESS OF.

**Watt, James** (1730-1819), Scottish engineer, *b.* at Greenock. He became mathematical instrument maker to Glasgow Univ. in 1757. He was employed on



JAMES WATT

Engraving after a picture by Sir W. Beechey.

surveys for the Forth and Clyde Canal (1767), as well as for the Caledonian and other canals, and he was also concerned with the deepening of rivers, including the Forth and Clyde, and with the improvement of the harbours of Arr, Port Glasgow, and Greenock. He had already begun to think about steam as a motive force, and in 1764, while repairing a model of John Newcome's pumping engine, discovered the cause of its waste of power. He, therefore, in 1765 devised the separate condenser to obviate the defect, and in 1769 patented his 'Watt' steam engine, which was manufactured at the Soho Ironworks, W. having entered

into partnership with Boulton of Soho near Birmingham. His crowning achievement was the invention of the governor or apparatus for regulating the working speed of an engine under varying conditions of load. Between 1781 and 1785 he obtained patents for the sun and planet motion, the expansive principle, the double engine, the parallel motion, and a fuel-saving furnace. He also invented copying-ink and discovered independently the composition of water. *Correspondence* regarding this latter discovery was ed. by J. P. Muirhead (1846). *See* lives by J. P. Muirhead, 1858; and T. H. Marshall, 1925; S. Smiles, *Lives of Boulton and Watt*, 1865; and H. W. Dickinson and R. Jenkins, *James Watt and the Steam Engine*, 1927.

**Watt**, practical unit of electrical power, and the power obtained when a current of 1 ampere is conveyed through a difference of potential of 1 volt. The number of Ws. is obtained from the products of the number of volts and amperes operation. Thus Ws. = amperes  $\times$  volts. It is equal to 10 ergs per second and 746 Ws. = 1 h.p.

**Watteau, Jean Antoine** (1684-1721), Fr. painter, *b.* at Valenciennes. He went to Paris in 1702, and after enduring much privation he was eventually recognised, being made a member of the Fr. Académie in 1717, and painter to the king in the following year. Despite his premature death W. exercised a profound and lasting influence on Fr. art, and left a great number of pictures behind him. Many of them are now in the Louvre, and others are in the Wallace Collection. He excelled in his imaginative portrayal of scenes from It. comedy, elegant party groups, ever delicate, brilliant, and witty. He was, however, an innovator whose work gave inspiration to many less gifted contemporaries. His draughtsmanship was superb and he had complete mastery of atmosphere and composition. *See* E. Staley, *Watteau and His School*, 1907; and D. Sutton, *French Drawings of the Eighteenth Century*, 1949.

**Wattignies**, hamlet in the dept. of Nord, France,  $5\frac{1}{2}$  m. S.S.E. of Maubeuge. Here, on Oct. 16, 1793, the Fr. under Carnot and Jourdan defeated an allied force, mainly Austrians, under Coburg.

**Wattle**, *see* ACACIA.

**Wattmeter**, electrical instrument for measuring electrical power. The power or the rate of doing work in a circuit is equal to the product of the pressure and the current.

**Watts, George Frederick** (1817-1904), Eng. painter and sculptor, *b.* in London. He studied art in the studio of William Behnes, the sculptor, and also at the Royal Academy schools. In 1843, when sev. prizes were offered for cartoons to decorate the Houses of Parliament, W. competed and won £300. He became a Royal Academician in 1867. In 1864 he married Ellen Terry (*q.v.*). In 1902 he was made a member of the newly instituted Order of Merit. Some of his pictures are in the Tate Gallery, and the National Portrait Gallery, and there is a permanent

exhibition at Limnerslease in Surrey. Among his best-known paintings are 'Hope,' 'Love,' and 'Death,' represented by large symbolical figures, showing great sensitivity in treatment and composition. See lives and studies by H. Macmillan, 1903; G. K. Chesterton, 1904, 1914; Mary Watts, 1912; and E. R. Dibdin, 1923.

**Watts, Isaac** (1674-1748), Eng. divine and hymn-writer, b. at Southampton of Nonconformist parents. W. attended a small independent school and, later, a Dissenting academy at Stoke Newington. In 1702, after some years of educational work, he took the independent pastorate at Mark Lane Chapel in London. He became eminent as a preacher, but had to retire in 1712 owing to ill health, and for the last thirty-six years of his life he resided at Theobald's or at other homes of his friend, Sir Thomas Abney (*q.v.*) During these years he compiled educational manuals, and pub. doctrinal treatises of Arian tendencies. He pub. between 500 and 600 hymns, including 'O God, our help in ages past,' and 'When I survey the wondrous Cross.' His collected works (6 vols.) appeared in 1753. See lives by E. P. Hood, 1875; and A. P. Davis, 1948; T. Milner, *Life, Times, and Correspondence of I. Watts*, 1834; and B. Manning, *The Hymns of Wesley and Watts*, 1932.

**Waugh, Alexander Raban (Alec)** (b. 1898), Eng. novelist, b. at Hampstead, and educated at Sherborne school. He made his reputation by *The Loom of Youth* (1917), a realistic novel of school life.

**Waugh, Evelyn Arthur St. John** (b. 1903), Eng. novelist and satirist, educated at Lancing and Hertford College, Oxford. His work, though light in texture, expresses a deep philosophy, strongly coloured, in his later works, by his Catholic convictions. His pub. include *Decline and Fall* (1928), *Edmund Campion* (1933), *Brideshead Revisited* (1945), and *The Loved One* (1949).

**Waukegan**, city and co. seat of Lake co., Illinois, U.S.A., on the W. shore of Lake Michigan, 36 m. W. by N. of Chicago by rail, a health resort with valuable mineral springs. It has a good harbour and is a shipping centre. W. manufs. asbestos roofing, steel, brass, wire, drugs, motors, and radio accessories. Pop. 34,200.

**Waukesha**, co. seat of Waukesha co., Wisconsin, U.S.A., 15 m. W. of Milwaukee, a popular holiday resort with the celebrated Bethesda medicinal springs, the water of which forms a valuable export; there are extensive lime quarries. W. manufs. iron and steel, and agric. implements. Pop. 19,200.

**Wausau**, co. seat of Marathon co., Wisconsin, U.S.A., on the Wisconsin R., is a centre of the lumber trade and paper industry. It has electric power plants, and is a health resort in both summer and winter. Pop. 27,300.

**Wave**, movement on water (see SEA WAVES AND SWELL). The term *wave* has also a wider significance. All material sub-

stances have some degree of elasticity, and any molecular disturbance which takes place in the body will be propagated through the body in virtue of this elasticity. Elasticity may appear in two different forms, such as the resistance offered to change of bulk and the resistance offered to change of shape. The former is called bulk elasticity or degree of *incompressibility*, and the latter *rigidity*. In gases and most liquids, such as water, the resistance to change of bulk is the only one which exists, and any propagation which takes place through the medium of these fluids is due to this type of elasticity. Such Ws. are called *longitudinal*, and consist of periodic variations of density in the medium. See also ETHER; ELECTRICITY; HEAT; LIGHT; RADIO; SOUND.

**Wavell of Cyrenaica, Archibald Percival Wavell**, first Earl (1883-1950), Brit. soldier and administrator, b. at Colchester. W. was educated at Winchester. After passing out of Sandhurst he served in the S. African war as an officer in the Black Watch and then on the Indian N.W. frontier. In the First World War he was sent in 1916 to Russia as military attaché to the army of the Caucasus. When Russian resistance collapsed he was transferred to Allenby's staff in the Middle E. In 1937 he was appointed commander of the Brit. troops in Palestine during the Arab-Jewish troubles and handled the situation skillfully. After the Munich Pact he was given the S. Command in Britain and, in June 1939 was sent to Cairo as commander-in-chief of the Brit. forces in the Middle E.

After the collapse of France in 1940 he was called on to defend the entire Middle E. with a few divs. of Brit. troops and a handful of planes. As commander of outnumbered armies during the three years of Britain's delaying fight, W. sustained defeat after defeat, but the net gain of his delaying battles, which disrupted the whole Ger. time-table, was incalculable. He won a brilliant victory over Graziani against tremendous odds in Libya (Dec. 1940-Feb. 1941), but was then forced to send 60,000 of his troops together with sev. R.A.F. squadrons, besides numerous tanks and guns, to the defence of Greece, a campaign dictated largely by political considerations. Simultaneously, however, he maintained a deceptive and constant harrying attack in force upon the Sudan, while preparing his offensive against It. E. Africa, a campaign thoroughly planned and brilliantly executed against odds of about 25,000 to 250,000. (See AFRICA, NORTH, SECOND WORLD WAR, CAMPAIGNS IN; ITALIAN EAST AFRICA, CAMPAIGN IN.) At this time a revolt in Iraq and Ger. intrigues in Persia and, in collusion with the Vichy Fr., in Syria, called for prompt military action. W. appears not to have expected Rommel's counter-offensive to be launched as soon as it was, and the Brit. intelligence service was deceived on the strength of the Ger. forces then in Libya.

After the Gk. débâcle and the loss of Cyrenaica, W. was sent to India, but, soon after he was promoted to supreme command in the Far E. against Japan, and after the fall of all the Brit. and Dutch colonial possessions in the S. Pacific he returned to India to organise the stand against the Jap. there and in Burma. He was in Singapore until the Jap. troops entered the is.

W. was a great strategist and a recognised master of staff-planning rather than of administrative problems, and one of the few Brit. high commanders who, long before the Second World War, grasped the importance of mechanised and aerial warfare. He became Field Marshal on Jan. 1, 1943. In the same year he was appointed viceroy in succession to Lord Linlithgow and at once took effective measures to check famine conditions in Bengal. He was replaced as viceroy by Lord Mountbatten in 1948. (See further under INDIA.) His pubs. include *Allenby: a Study in Greatness* (1940); *Generals and Generalship* (1943); *Allenby in Egypt* (1943); *Other Men's Flowers* (1944), an anthology of poetry; *Speaking Generally* (1946); and *The Good Soldier* (1948). A critical discussion of W.'s actions in the Second World War is contained in Winston S. Churchill's *The Second World War* (vol. III), 1950. See also W.'s various *Dispatches*; lives by R. H. Kiernan, 1945, and R. J. Collins, 1948; and H. A. De Weerd, *Great Soldiers of the Second Great War*, 1946.

**Wavellite**, hydrated aluminum phosphate, occasionally containing iron oxide and fluorine.

**Waveney**, riv. of England, rises near the Little Ouse and forms part of the boundary between Norfolk and Suffolk. It flows past Diss, Bungay, and Beccles, and has a course of nearly 50 m., being navigable by barges to Bungay. The W. joins the Yare 4 m. S.W. of Great Yarmouth.

**Wax**, name given to various animal, vegetable, and mineral substances, which resemble beeswax in having a peculiar lustre. Ws. resemble fats in that they are lighter than water, melt on heating, and burn well. They are soluble in turpentine, but are insoluble in water and cold alcohol, and differ from true fats in that they do not yield glycerine when boiled with alkalis. Beeswax, the most commonly known W., is secreted by bees, and is obtained by heating the 'honey-combs' in water, when the W. rises to the surface. In the crude state this W. is of impure yellow colour, has a melting point of 63° C. and a sp. gr. of 0.96. It contains 12-15 per cent cerotic acid and some 80-85 per cent of myricin or myricyl palmitate. For candle-making the W. is bleached in the sun after treatment with acid. The W. is also used for waxing floors, for making varnishes and lithographic crayons. Chinese W., which is used for candle-making in Japan and China, is produced by an insect (*Coccus cerifera*), and consists chiefly of ceryl cerotate. Japan W. is obtained from the seeds of a species of *Rhus* (*R. succedanea*).

It consists mainly of palmitin, is green when raw, and is bleached in the sun. Myrtle-berry W. is another vegetable W. made from the plant *Myrica cerifera*. Palm W., or Carnauba W., is produced from the leaves of the W. palm of Brazil (*Corypha cerifera*) and the Andes (*Cerozylon andicola*). The W. is found on the leaves of the palm, and these are cut and dried in the sun. The W. is then obtained as a fine powder, when the leaves are shaken. Spermaceti (q.v.) is a W. obtained from the head of the sperm whale. As an example of a mineral W., ozokerite (q.v.) may be mentioned. The most important mineral W. is paraffin W. It is obtained by distillation of petroleum or oil shales, and is largely used for candle-making, as insulating material, in laundries with starch, for waterproofing textiles, and for making pomades and polishes. Other waxes used in industry are as follows: Candellilla, a hard wax from Mexico; Shellac W.; Montan W. (bituminous origin); Ouricoury (palm leaf); and Esparto (Sp. grass).

**Wax Flower** (*Hooya*), or Honey-plant, evergreen climbing plant of the family Asclepiadaceae, with thick leaves and wheel-shaped, waxy-looking flowers in clusters.

**Wax Flower, Clustered**, see STEPHANOTIS.

**Wax Myrtle**, see BAYBERRY.

**Wax Palm**, see under WAX.

**Waxing**, *Ampelis garrulus* of Linnaeus and later ornithologists, bird of cinnamon-brown plumage changing in parts to grey or chestnut, and relieved by black, white, and a yellow band to the tail. It is easily distinguished from all other birds by the curious expansion of the shaft of some of its wing-feathers at the tip into an appearance of drops of scarlet sealing-wax. The W. is a rare visitor to Britain from the forests of N. Europe and Asia.

**Waxy Degeneration**, see AMYLOID DISEASE.

**Way, Right of**, see RIGHT OF WAY.

**Wayland the Smith**, mythical farmer, the Voland or Wieland of Norse legend. His tradition is kept alive in England by Wayland's Smithy, a famous megalithic long-barrow at Ashbury, Berks., on the capstone of which the wayfarer might leave a groat and find his horse shod by an invisible smith. During the scientific excavation of the barrow in 1919, two iron currency bars dating from the Early Iron Age were recovered from the foot of the capstone. It was known as *Welandae smithan* in a Compton Beauchamp charter granted in 955 by King Edred.

**Waynflete, William** (1395-1486), Eng. prelate, see under WAYNEFLEET.

**Way of the Cross**, see STATIONS OR WAY OF THE CROSS.

**Ways and Means and of Supply, Committees of**, are appointed by the House of Commons at the commencement of every session, so soon as an address has been agreed to, in answer to the speech from the Throne. The business of supply consists of proceedings on motions 'That Mr. Speaker do now leave the chair'; supplementary or additional estimates for

the current financial year; any excess vote; votes on account; main estimates, whether for the coming or the current financial year; and the consideration of reports from the committee of public accounts and the select committee on estimates. But such business may not include any vote of credit or votes for supplementary or additional estimates for war expenditure.

**Waziristan**, tract of land, now forming two political agencies of Pakistan, lying on the border between Afghanistan on the N.W., Baluchistan on the S., and the N.W. Frontier Province on the E. It is about 160 m. long from N. to S., and 60 m. from E. to W. The W. half is very mountainous. The land slopes E., and is, when irrigated, fertile in the N. round Bannu, but too dry to be pastoral further S. Area 5700 sq. m. See H. de Wetteville, *Waziristan*, 1925.

**Weald**, England, specifically the area between the N. and S. Downs, and the Butser Hills. The W. includes most of Kent, all Sussex, the S. part of Surrey, and parts of Hants. It is about 120 m. long, and 30 m. wide. The geological structure of the W. is that of a broad anticline with its axis E.S.E.—W.N.W. By reason of denudation processes, the oldest rocks are exposed in the centre, and are surrounded by horse-shoe shaped outcrops of progressively younger rocks. The Wealden Series which attains a thickness of some 2000 ft., consists of clays, sands, sandstone, ironstone, and shelly limestones. It consists of the W. Clay, and the Hastings Beds with their formations of Fairlight Clays, Ashdown Sands, Wadhurst Clay, and Tunbridge Wells Sand—all named from local exposures. In the large forest known as the Andreds W., iron ore was mined in Rom. times. Until their depletions in the early nineteenth century, the woodlands provided fuel for an extensive iron industry, and the oak was highly esteemed for shipbuilding. See R. Furley, *History of the Weald of Kent*, 1871-4; E. Straker, *Wealden Iron*, 1931; Brit. Regional Geology, Geological Survey, *The Wealden District*, 1948; and I. D. Margary, *Roman Ways in the Weald*, 1948.

**Wealdstone**, par. and former urb. dist. of Middlesex, England, now part of the Harrow urb. dist. W. is an industrial area, and its manufs. include photographic materials, glass, and paint-brushes.

**Wealth**. The Mercantilists regarded W. as money or 'treasure', measuring the profit of international trade by the amount of treasure, of gold and silver, which they could thereby amass. The Physiocrats brought the idea down to earth, teaching that increase in W. is to be measured by *produit net*, the surplus of agric. and mineral products over cost of production. For Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* meant a study of exchange values of every kind. While air and sunlight had enormous value in use, only things with value in exchange were measurable W. and the subject-matter of economics. Jean-Baptiste Say insisted that services are W. equally with material things. It may

seem fanciful to reckon a song as W.; but the modern statistician cannot make his national W. figures come right if he ignores the fee of the singer. National W. statistics have made great strides in recent years. Since 1941 an extremely valuable series of Brit. Gov. White Papers has given official estimates of the ann. production of national W. goods and services) over the period 1938-49, the 1949 figures being in *National Income and Expenditure of The United Kingdom 1946 to 1949* (Cmd. 7933, 1950).

The term National Income and Expenditure denotes two aspects of one thing. The essential equality of the national income (everybody's income) and the national expenditure (everybody's spending) is a particularly modern conception which is bound up with current appreciation of the fact that to achieve full business activity it is essential to see that spending is adequate. If the national income in money terms were the same as the national income in real terms that would be the end of the problem. 'Look after spending and income will look after itself' seems, and is, too easy a road to national W. Undue attention to the spending side would indeed give a satisfactory national income; but only on paper. Nevertheless, although adequate spending is not the whole truth it remains a most important element in the situation and one which is only now being properly valued. Since spending is the mainspring of trade and production, the dynamic approach to national income is *via* national expenditure. What is spent will make income (subject to company reserves not increasing). Whether income makes (full) expenditure in due course depends upon saving being matched by investment-spending. The income-spending income circuit takes time: on the average money makes income perhaps twice a year. While payment for a shoehine is spending and income at one and the same time, payment for a shop article makes income at varying intervals as costs are met further and further back along the production line.

Table 1 of Cmd. 7933 is a non-time-lag 'balance sheet' showing national spending in 1949 equalling national income in 1949 at £11,201,000,000, with small inventory and income-from-abroad items common to both sides. Table 2 shows another balance of income and expenditure at the same figure. The spending side shows ordinary spending (consumption), investment-spending (on capital goods), and the current spending of public authorities—making £12,834,000,000 'National Expenditure at current market value.' Shop prices, of course, include indirect taxes and the deduction of these (less subsidies) brings the net total down to £11,201,000,000. The income side shows a total for each type; whilst Table 1 groups wages, salaries, and other income by sources—current production and trade; public authorities; households. The spending side of Table 1 does not give shop prices but presents a picture of 'Gross National Product at factor cost'



—the cost of goods and services produced by enterprises, by public authorities, and emphasises that the national income is not money but the flow of goods and services that the money total attempts to epitomise. The home-produced National Product plus net-income-from-abroad gives the National Income—or rather National-Income-and-Provision-for-Depreciation, since a part of the product is necessarily dedicated to keeping the machine in being. Table A, page 638 (5: Cmd. 7933), gives a further 'income' arrangement of the figures for 1938 and for 1946-49. Line 12 National Income (Table A, page 638) is quoted in the *United Nations Statistical Yearbook* as 'national income at factor cost . . . the aggregate of all income earned in the production of goods and services (i.e.) the sum of all wages and salaries (including income in kind and social security contributions), rent, dividends, and interest, income of entrepreneurs, undistributed profits of corporations before taxes.'

In all, Cmd. 7933 offers thirty-four tables of essential statistics. Table 14 shows that, of the £2,465,000,000 spent on investment goods, the greater part comes from the depreciation provision and other reserves of enterprises, 'Gross personal saving' contributing only £127,000,000. But 'he who runs' may easily misread: the £127,000,000 is itself made up of £189,000,000 Death Duties; £64,000,000 Special Contribution; and not more than £174,000,000 personal saving in the every-day sense.

Double counting has to be guarded against. If a man earns £3,000 a year and employs a gardener at £300, both sums represent service and both properly reckon in the National Income. If the £3,000 man is taxed to pay £300 a year to pensioners rendering no current ser-

vice, then the £300 does not count. Table 2, accordingly, while showing, 'Transfer Incomes' (£228,000,000) deducts a like sum, as well as £591,000,000 'Debt interest paid by public authorities' before reaching a total of £10,226,000,000 net 'National Income' (as line 12, Table A). Indirect taxes cause an artificial inflation of the National Income, creating a difficulty which can be met statistically by using the 'shop price' total (see page 636) only where appropriate. Ordinary inflation can be countered approximately by the price index; but cannot simply be dubbed artificial since there is fundamentally no base year. Other difficulties remain. The whole concept of summing national income or national wealth in a single figure is, besides practical difficulties of measurement and time-lag, necessarily artificial to some extent, because 'the best things in life are free' and only those goods and services which are (usually) paid for are reckonable. If a man marries his housekeeper he reduces the (statistical) national income: the housekeeping services move from the paid to the unpaid category. While the practical difficulties are far from being overcome the White Papers are a remarkable achievement. They represent a period of evolution and advance in new statistical territory, and improvement in approximation and presentation is continuous; in particular, great progress has been made in reducing the field where an impressive balance is due to a mere residual item. The White Paper makes no attempt to capitalise the National Income figures: it would *inter alia* mean capitalising the value of labour (put at £47,000,000,000 in the 'nineties by Prof. Nicholson) as well as evaluating land and capital. The White Papers owe much to Colin Clark who produced annual

Year	National Income		Wholesale Price Index		Exchange Rate
	U.K. (£ million)	U.S. (\$ million)	U.K.	U.S.	£ worth (U.S. cents)
1930	3,957	75,003	92	100	486.2
1931	3,666	58,873	81	85	485.9 <sup>1</sup>
1932	3,568	41,690	79	75	350.4
1933	3,728	39,584	79	76	421.8
1934	3,881	48,613	81	87	504.1
1935	4,109	56,789	82	93	490.3
1936	4,388	64,719	87	94	497.1
1937	4,616	73,627	100	Base 100	494.4
1938	4,640	67,375	93	91	489.0
1939	5,037	72,532	95	89	467.3 <sup>1</sup>
1940	5,980	81,347	126	91	403.0
1941	6,941	103,834	140	101	403.0
1942	7,664	137,119	147	114	403.0
1943	8,171	169,686	150	119	403.0
1944	8,310	183,838	153	121	403.0
1945	8,355	182,691	155	123	403.0
1946	8,249	179,562	161	140	403.0
1947	9,071	201,709	176	176	403.0
1948	9,928	226,204	202	191	403.0

<sup>1</sup> Part Year

A NATIONAL INCOME AND DEPRECIATION  £ million		1938	1946	1947	1948	1949
	1. Wages . . . . .	1,735	3,155	3,600	4,050	4,280
	2. Salaries . . . . .	1,110	1,775	1,920	2,140	2,250
	3. Pay and allowances of the Armed Forces	78	530	347	246	245
	4. Professional earnings	84	133	156	170	172
	5. Income from farming	60	190	205	258	283
	6. Profits of other sole traders and partner- ships . . . . .	440	690	715	735	745
	7. Trading profits of companies . . . . .	543	1,275	1,590	1,685	1,590
	8. Operating profits of public enterprises	25	4	28	126	140
	9. Rent of land and buildings . . . . .	395	445	453	463	471
	10. Income arising in the United Kingdom . . .	4,470	8,197	9,014	9,873	10,176
	11. Net income from abroad . . . . .	168	52	57	55	50
	12. National income . .	4,638	8,249	9,071	9,928	10,226
	13. Depreciation . . .	450	675	750	775	975
	14. National income and depreciation . . . .	5,088	8,924	9,821	10,703	11,201

Range of Income before Tax	Number of Incomes <sup>1</sup>	Total Income before Tax <sup>2</sup>	Total Income after Income Tax and Surtax <sup>3</sup> at		Proportion of Income before Tax retained after deduction of Taxes at	
			1938-39 rates	1948-49 rates	1938-39 rates	1948-49 rates
	000's	£ million	£ million		Per cent	
1938						
Personal income which can be allocated to different ranges:						
Under £250 <sup>4</sup> . . . .	—	2,467	2,463	2,451	99.8	99.4
£250-499 . . . . .	2,000	679	662	641	97.5	94.4
£500-999 . . . . .	670	455	415	386	91.2	84.8
£1,000-1,999 . . . .	224	304	259	223	85.2	73.4
£2,000-9,999 . . . .	98	360	255	196	70.8	54.4
£10,000—and over . .	9	175	76	36	43.4	20.6
1948						
Personal income which can be allocated to different ranges:						
Under £250 <sup>4</sup> . . . .	—	2,439	2,429	2,411	99.6	98.9
£250-499 . . . . .	8,650	2,929	2,855	2,770	97.5	94.6
£500-999 . . . . .	2,295	1,519	1,391	1,296	91.6	85.3
£1,000-1,999 . . . .	545	730	624	543	85.5	74.4
£2,000-9,999 . . . .	209	729	524	415	71.9	56.9
£10,000—and over . .	11	195	89	47	45.6	24.1

## C. DISTRIBUTION OF PERSONAL INCOME BY RANGES OF INCOME

<sup>1</sup> A married couple is for income tax purposes counted as one individual.<sup>2</sup> In addition to the income shown in the table there are amounts accruing to persons that cannot be allocated to particular ranges of income. These are estimated to have been £450,000,000 in 1938 and £1,213,000,000 in 1948.<sup>3</sup> The estimates of income relate to calendar years; the tax-rates are for fiscal years.<sup>4</sup> All transfer incomes other than family allowances and post-war tax credits have been included in incomes under £250.

	1938	1946	1947	1948	1949	B
<i>Before Taxes on Income</i>						<b>PERSONAL INCOME FROM WORK AND PROPERTY BEFORE AND AFTER TAX</b>  <i>Percentages</i>
Wages . . . . .	37	40	43	45	45	
Salaries . . . . .	24	22	23	23	24	
Pay of the Armed Forces . . . . .	2	7	4	3	3	
Rent, dividends, and interest <sup>1</sup>	37	31	30	29	28	
Personal income from work and property . . . . .	100	100	100	100	100	<sup>1</sup> Including professional earnings, income from farming and profits of other sole traders and partnerships.
<i>After Taxes on Income</i>						
Wages . . . . .	39	43	46	47	48	
Salaries . . . . .	25	22	23	21	24	
Pay of the Armed Forces . . . . .	2	8	4	3	3	
Rent, dividends, and interest	34	27	27	26	25	
Personal income from work and property . . . . .	100	100	100	100	100	

Year	Total Income	Income above Tax Exemption Limit	Income below Tax Exemption Limit	Of those below Exemption Limit		Authority
				Inter-mediate Class	Wage-earning Class	
	£m.	£m.	£m.	£m.	£m.	
1688	43	—	—	—	—	Davenant and Gregory King.
1740	64	—	—	—	—	Decker.
1783	200	—	—	—	—	Giffen.
1800	230	—	—	—	78	Mulhall.
1812	431	—	—	—	—	Colquhoun.
1835-40	515	250	265	94	171	Giffen.
1851	646	272	374	132	242	Levi.
1852	440	220	220	—	—	W. Farr.
1864	814	370	444	—	—	Levi.
1867	961	423	538	120	118	Levi.
1867	814	396	418	94	324	Baxter.
1875	1,200	—	—	—	—	Giffen.
1881	1,168	577	591	143	448	Levi.
1883	1,270	602	668	118	550	Giffen.
1883	1,274	613	661	140	521	Levi.
1883	1,289	—	—	—	—	Mallet.
1888	1,300	660	640	—	—	Mallock.
1889	1,285	—	—	—	467	Mulhall.
1891	1,600	—	—	—	—	Bowley.
1903	1,750	—	—	—	—	Giffen.
1904	1,710	830	880	225	655	Money.
1907	1,945	880	1,065	325	740	Bowley.
1907	1,844	909	935	232	703	Money.
1907	1,964	672	1,292	—	—	Mallock.
1907	2,038 <sup>4</sup>	800	1,206	325	881	Whittaker.
1908	1,920	—	—	—	730	Fabian Society.
1914	2,100	—	—	—	—	Money.

## D. ESTIMATES OF THE NATIONAL INCOME

<sup>1</sup> Exemption limit £150.    <sup>2</sup> Exemption limit £100    <sup>3</sup> Exemption limit £100<sup>4</sup> Including £32,000,000 income of Charities, Friendly Societies, and Local Authorities (excluded from sub-divisions)

Tables A, B, and C are reproduced from Tables 5, 9, and 10 of Command 7911, *National Income and Expenditure of the United Kingdom, 1946-49 (1950)* by permission of the Controller of His Majesty's Stationery Office. Table D is based on a table by Sir Thomas Whittaker and reproduced from the late Lord Stamp's *British Incomes and Property (1916, 1920)* by permission of the author's executors and Staples Press Ltd.



the wind at various heights, which experience has shown are of importance in forecasting. The forecaster then considers the factors which affect the air masses, such as sunshine by day, its absence at night, the movement of the air masses across different types of country and the expected changes in the winds. Constant appeal both to physics and the forecaster's knowledge of similar past situations must be made. (See further under METEOROLOGY.) According to the use made of it, the W. F. is in different forms: (1) as printed in the press or broadcast by the B.B.C. for general public use: this is in very brief terms, the areas being distinguished by the names in Map 1; (2) as broadcast for special users such as shipping or private aviation: the Shipping Bulletins are broadcast by R/T or W/T from Post Office stations for the separate sea areas shown in Map 2; aviation forecasts are broadcast by Air Traffic Control Centres; (3) as individual, local, route, and area forecasts, by request, for flying purposes; (4) as special warnings and forecasts for power authorities (with special attention to temp.), for transport authorities and road engineers (frost, fog, and snow), and for farmers (frost and prospect of dry spells for haymaking, etc.). W. Fs. can be obtained by telegraph or telephone.

See L. W. C. Pack, *Weather Forecasting*, 1949.

**Weathering.** see under GEOLOGY, *Dynamical Geology*.

**Weaver Birds**, or *Ploceidae*, family of passerine birds allied to the finches, so called on account of their remarkable nests, which, in some cases, are immense structures occupied by a colony of birds. They are most numerous in Africa, but extend to Asia and Australia. Most of them are brightly coloured, particularly in the breeding season. The bodies are somewhat elongated and the tails long, and the prominent conical bill is very powerful.

**Weaving.** see under COTTON SPINNING AND MANUFACTURE; FABRICS, TEXTILE; AND WOOL.

**Webb, Beatrice (Lady Passfield)** (1858-1913), Eng. social reformer, b. at Standish, Gloucester. Before finally deciding to pursue social investigations, she studied conditions among the Lancashire cotton operatives and acquired further experience in social institutions by association with Samuel and Henrietta Barnett at Toynbee Hall. It was, however, Charles Booth's *Life and Labour in London* which really determined her to embrace such a career. In 1891 she pub. *The Co-operative Movement in Great Britain*, which is still a standard work. Soon after this she met Sidney Webb, whom she subsequently married (1891). The first joint pub. of the Webbs was their well-known book *The History of Trade Unionism*. A firm believer in the efficacy of Royal Commissions, she herself served on many, beginning with the Royal Commission on Poor Law and Unemployment, 1905-9. With Sidney Webb (see PASSFIELD), she issued the minority report which initiated

the Socialist agitation for the reform of the old Poor Law. She joined the Fabian Society (q.v.) and later became its president. She and her husband carried out researches in the hist. of trade unionism, the Poor Law, and Russia, and their pub. on these subjects are recognised as standard works. (See under PASSFIELD.) Independently she pub. her autobiography in *My Apprenticeship* (1926); an account of her earlier years, *Our Partnership*, appeared in 1948.

See life by Margaret Cole, 1945; and ed. by the same author, *The Webbs and their World*, 1949.

**Webb, Mary** (1881-1927). Eng. novelist, b. at Leighton, Shropshire. She had written a book of poems on nature, *The Spring of Joy* (reprinted in 1946), and four novels, *The Golden Arrow* (1916), *Gone to Earth* (1917), *The House in Dormer Forest* (1920), and *Seven for a Secret* (1922), before *Precious Bane* was pub. in 1924. This last was awarded the Femina Vie Heureuse Prize and in 1927 became suddenly and immensely popular. Shropshire is the scene of all her novels, which depict a curiously primitive rural life, have unusual imaginative power and pathos. See lives by W. R. Chappell, 1930, II. Addison, 1931, and T. Monit (3rd ed.), 1935.

**Webb, Matthew** (1748-83), popularly known as 'Captain' W., Eng. swimmer, b. at Dawley, Shropshire. He was trained for the mercantile marine on the *Conway*, apprenticed in 1862, becoming mate (1866) and captain (1875). He successfully swam the Channel (the first to do so) from Dover to Calais without artificial aid in Aug. 1875, covering about 40 m. in 21 hrs. 45 min. He was drowned in an attempt to swim the rapids at the foot of the Niagara Falls.

**Webb, Sidney James**, see PASSFIELD, BARON.

**Weber, Carl Maria von** (1786-1826), Ger. composer, b. at Eutin in Holstein. His father, in 1797, put him under the tuition of Michael Haydn in Salzburg. He afterwards became music-director at Breslau, where he wrote *Rübezahl* (1804-5). *Abu Hassan* appeared in 1811. In 1822 he brought out in Berlin his greatest opera, *Der Freischütz*, which was first performed in London in 1824 and everywhere made a profound impression. Then followed his *Euryanthe* at Vienna in Nov. 1823. In 1825 he accepted an offer to write an opera for Covent Garden from the libretto of Planché and the result was *Oberon*, founded on Wieland's poem. In the hist. of music, W. belongs to the nineteenth century, and he is the first national Ger. musician. Though versatile, his main creative effort was directed towards opera, and as a composer of chamber and symphonic music he was limited by an over-brilliance and theatricalism.

See life by his son M. M. von Weber (Eng. trans. 1865); and lives and studies by G. Kaiser, 1910; J. Kapp, 1922, 1931; E. Kroll, 1934; W. Saunders (Master Musicians), 1940; and H. Dünnebeil (2nd ed.), 1942.

**Weber, Ernst Heinrich** (1795-1878),

Ger. physiologist, anatomist, and psychologist, b. in Wittenberg. He studied medicine at Wittenberg and Leipzig. At Leipzig he was prof. of comparative anatomy (1818), human anatomy (1821), and from 1840 of human anatomy and physiology. In 1834 he proposed what is now known in psychology as Weber's Law, thus stated by J. M. Baldwin: 'The least added difference of stimulus that can be noticed is a constant proportional part of the original stimulus: thus, if one pound when lifted can just be discriminated from one pound and one ounce, ten pounds cannot be discriminated from ten pounds and one ounce, but the difference needs to be ten ounces.' Fechner verified this principle, and was the first to call it Weber's Law. It is approximately true for hearing, sight, pressure, and muscular sense: it seems inapplicable to taste and smell, or nearly so. W. also discovered the existence of a rudimentary uterus in male mammals. See K. F. W. Ludwig, *Rede zum Gedächtnis an E. H. Weber*, 1878.

**Webster, Daniel** (1782-1852), Amer. orator, statesman, and jurist, b. at Salisbury, New Hampshire, entered Congress for the second time in 1822, was elected to the Senate in 1828, and eight years later unsuccessfully ran for the presidency. W. became the hero of the N. in 1830 by his speech in reply to Senator Hayne. The slavery question and the threat of secession had already come up. W.'s speech, with its peroration, 'Liberty and Union, now and forever, one and inseparable,' is treasured in Amer. annals.

**Webster, John** (c. 1580-1625), Eng. dramatist, b. in London, son of a tailor, was apprenticed to the same craft, and in 1603 was made a freeman of the Merchant Taylors' Company. Between 1602 and 1607 he collaborated with Heywood, Dekker, Middleton, and Chet'le. W. wrote tragedies, historical plays, and comedies. The first play written entirely by himself, and printed in 1612, was a tragedy entitled *The White Devil*. His masterpiece was *The Duchess of Malfi*, also a tragedy, first performed by the King's Men at Blackfriars in 1616, and frequently revived.

Superficially, W.'s tragedies seem to be mere melodrama, because the cruelty and terror which pervade his theatrically-effective scenes seem to lack adequate motive and credibility. But behind this background of macabre violence the poet in W. sees life itself as pitiless and cruel and this elevates his violence into a philosophy. Of the three boisterous comedies, *Westward Ho* and *Northward Ho* (1607), were written in collaboration with Dekker; *A Cure for a Cuckold* (printed 1661) with Rowley. His *Complete Works* were ed. by F. L. Lucas, 1927. See also life by E. E. Stoll, 1905; F. E. Pierce, *The Collaboration of Webster and Dekker*, 1909; and R. Brooke, *John Webster and the Elizabethan Drama*, 1916.

**Webster, Sir Richard Everard**, see ALVERSTONE, VISCOUNT.

**Webster, tn.** of Worcester co., Massachusetts, U.S.A., 16 m. S. by W. of

Worcester, on French R. It has iron and brass foundries, and manufs. cotton and woollen goods., Pop. 13,200.

**Wedderburn, Alexander**, first Baron Loughborough, and first Earl of Rosslyn (1733-1805), Scottish lawyer and statesman, b. at Edinburgh. He was called to the Bar, 1754, but left Scotland and came to London, where he became a member of the Inner Temple, 1757. In 1778 he became attorney-general, and 1780-83 lord chief justice of common pleas.

**Wedding Ceremonies**, see MARRIAGE AND MARRIAGE LAW.

**Wedgwood, Josiah** (1730-95), Eng. manufacturer of pottery, b. at Burslem in Staffordshire. He worked in his brother's pottery until in 1759 he estab. his own manufactory, where he produced a cream-coloured porcelain, patented by him in 1763. He executed a table-service for Queen Charlotte (whence its name, Queen's ware). From 1775 he employed John Flaxman, the sculptor, to execute designs, and studied to create only the most beautiful and delicate ware. He pub. pamphlets on his art, and his catalogues were trans. into many European languages. See lives by E. Meteyard, 1865-66; and A. H. Church, 1891; also W. Burton, *Josiah Wedgwood and his Pottery*, 1922; and J. M. Graham and H. C. Wedgwood, *Wedgwood*, 1948.

**Wedmore**, vil. of Somersetshire, England, noted for the treaty (sometimes called the treaty of Chippingham) concluded here (878) between King Alfred and Guthrum the Dane, by which the country N. of Watling Street was ceded to the Danes.

**Wednesday** (A.S. *Wodnesdæg*, Woden's Day), fourth day of the week. It was the *Dies Mercurii* of the Romans, whom the Fr. follow in calling it *Mercredi* (Mercury's Day).

**Wednesbury**, municipal and parl. bor. of Staffordshire, England, 8 m. N.W. of Birmingham. In Saxon times it was a fortified stronghold and was later referred to in the Domesday Book. Coal was certainly dug as early as 1315. There are manufs. of tubing, boiler plates, axles and springs, bridges and girders, railway rolling stock, and much general engineering is carried on. Coal and iron are worked in the neighbourhood. Pop. (estimated) 34,900.

**Weeds**, unwanted plants on the farm and in the garden. The prevalence of certain W. indicates the state of soil fertility. Spurrey, sheep's sorrel, plantains, daisies, heartsease, bracken and dandelion suggest acidity; sedges, rushes, mare's-tails, cotton-grass and meadow-sweet suggest waterlogging; leguminous W. (vetches, trefoil, etc.), imply lack of nitrogen; but many W. are ubiquitous. The presence of W. provides undesirable and costly competition for cultivated crops and plants. Some W. are parasitic (e.g. dodder).

The problem of weed-control is many-sided, and perennial. W.-seeds may be carried by air currents, water, transport, or foot. Perennial W. with big, underground root systems are very persistent.

Great advances in control have been made during the past twenty-five years. It is most important to control W. early in the growing season. Ann<sup>1</sup> and biennial W. (groundsel, goosefoot, etc.) readily succumb to hoeing and cultivating throughout spring and early summer. Surface-rooting W. (buttercup, nettles, etc.) may be destroyed in autumn digging by burying 18 in. or more deep. Deep-rooting W. (coltsfoot, bindweed, goutweed, etc.) may be brought under control by removing all roots to a depth of 24 in. and then controlling top growth for the following year by regular hoeing. Control of W. by use of flame-guns, searing with a flame of 2,000° F., is efficient, and useful in sterilising seed beds before sowing. Biological control of W. is in its infancy.

The chemical control of W. is undertaken with two objectives: the complete elimination of all vegetation from a treated area, and the eradication or control of undesirable W. only, leaving the cultivated plants unharmed. The first objective is achieved by the use of a toxic chemical killing the vegetation and temporarily sterilising the soil, and is applicable to paths, courtyards, hard tennis courts, railways, etc., or to areas intended for reclamation. Sodium chlorate, being non-poisonous, is the most popular chemical for blanket weed-control. At rates of 50 to 300 lb. per acre, sodium chlorate eliminates all W. and renders the soil sterile for four to six months, after which it may be cultivated. Other chemicals for complete weed eradication are salt, arsenic compounds, boron compounds, oils, etc. Chemical control of W. among growing crops or plants depends on the selective action of the chemicals. Dilute solutions of sulphuric acid, copper sulphate, copper chloride, dinitro-orthocresol (D.N.O.C.) or certain 'growth-promoting' substances (M.C.P.A. and D.C.P.A.) may be used to kill W. in cereal and onion crops. The chemical solution runs off the smooth-leaved crop plants but adheres to rough-leaved W. and kills them. Heavy applications of certain fertilisers (sulphate of ammonia, calcium cyanamide, kamite, nitrate of soda), have a similar selective action, chiefly on cereal and grass crops, but should not be used without reference to the state of soil fertility and condition. In the garden, selective chemical weed-control is chiefly applied to lawns. Sulphate of ammonia applied alone at  $\frac{1}{2}$ –1 oz. per sq. yd., or in conjunction with sulphate of iron in the formula for lawn sand (3 parts by weight sulphate of ammonia, 1 part sulphate of iron, 20 parts sharp sand or friable compost) at 4–6 oz. per sq. yd. in spring destroys plantains, daisies, clovers, and other rough-leaved W., and by subsequent fertilising action encourages the grasses. New selective lawn weed-killers are based on growth-promoting substances of plant hormones: 2-methyl-4-chlorophenoxyacetic acid (M.C.P.A.); 2 : 4 dichloro-phenoxyacetic acid (D.C.P.A.). These substances act directly, quickening and distorting growth so much as to encompass the death of

affected plants. Broadly, dicotyledon plants are susceptible; monocotyledons are not. Consequently, applications of these weed-killers leave grasses unaffected but many weeds, such as plantains, dandelions, docks, self-heal, chickweed, buttercup, etc., are killed. A judicious use of lawn sand and a selective weed-killer based on a growth-promoting substance effectively controls most lawn W. W. in garden beds and borders among cherished plants can be chemically controlled provided the chemical is applied to the weed foliage only, either by painting or controlled spraying. Stubborn W. such as bindweed, goutweed, and coltsfoot can be controlled by this means. See H. C. Long and W. E. Brechley, *Suppression of Weeds*, 1946; W. W. Robbins, A. S. Crafts, and R. N. Raynor, *Weed Control*, 1942; and S. B. Whitehead, *Garden Weeds and their Control*, 1949.

**Week** (O. E. *vice*), period of seven successive days, as in Jewish and Christian calendars, especially such a period beginning with Sunday and including in addition to that day Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday. The W. has been in use in E. countries from the earliest times, but was not introduced into the Rom. calendar till after the reign of Theodosius (fourth century A.D.). The names of the days of the W. are derived from the planets, the hours being allotted to the seven planets in the order of their supposed distances from the earth, and each planet being regarded as presiding over the day whose first hour belonged to it. Thus the days of the Rom. W. were assigned in order to the Sun, the Moon, Mars, Mercury, Jupiter, Venus, and Saturn. The Lat. nations have retained the names derived from these deities, but in the Germanic languages they are replaced by names derived from those of the corresponding Germanic deities, Tyr being regarded as the equivalent of Mars, Woden of Mercury, Thor of Jupiter, and Freya of Venus.

**Weems**, see under EARTH-HOUSE, and UNDERGROUND DWELLINGS.

**Weemen**, vil. and dist. of Natal. S. Africa, 35 in S.E. of Ladysmith. W. means 'wailing' or 'weeping' and was so-called after the massacre by Dingaan of many Europeans between Natal and W. following the murder of Relief in Feb. 1838.

**Weetslade**, former urb. dist. of Northumberland, England, now part of Longbenton urb. dist.

**Weevils**, *Plant-eating Beetles*, or *Curculionidae*, family of beetles of the group Rhynchoptera of the family Coleoptera. They are characterised by the possession of a distinct beak or snout which is sometimes very long. The larvæ are white, fleshy grubs with wrinkled skin and bent bodies, and usually have no legs. These and the beetles of many species cause great damage to cultivated plants, while many cause much loss by their destruction of grain. The large brown pine W. (*Hyllobius abietis*) is a serious pest of forest trees, often destroying ac. of young conifers, most of the damage being done

by the adults. Garden Ws. feed at night and seek shelter during the day, and can be caught by laying sacks on the ground.

**Weichsel**, see **VISTULA**.

**Weighing Machines.** The earliest form of scale was the equal armed balance (q.v.) which is a beam, or lever, resting on a fulcrum placed exactly half-way between the end pivots from which the scale pans are suspended. The weights placed in one pan are exactly equal to the weight of the object in the other pan when the beam of the scale is in equilibrium. Counter scales have the pans above the beams or levers, an advantage made possible by the inventions of Roberval and Béranger. The modern self-indicating counter scale with a chart showing correct weight and price computations is controlled by a pendulum

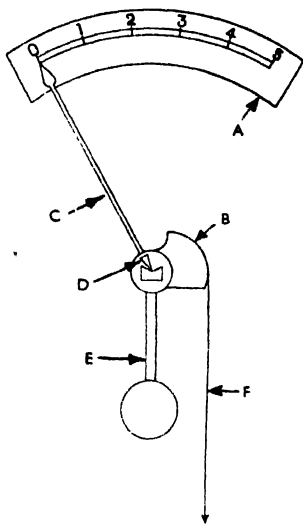


DIAGRAM OF A COUNTER SCALE

A, chart; B, cam; C, indicator; D, knife-edge; E, pendulum; F, connecting band.

or spring resistant unit. The figure shows a typical Avery counter scale indicator mechanism consisting of a weighing pendulum pivoted upon a knife-edge; the load from the scale pan is transmitted through the levers and the connecting band to the cam fixed to the body of the pendulum. As the pendulum swings to a position of equilibrium the indicator pointer registers the weight on the chart. A dashpot is used to damp out vibrations of the pendulum.

In scales for weighing heavier loads the weights or poises are only a small proportion of the weight of the goods being weighed. Such machines consist essentially of a lever, or a system of levers, in

which the fulcrum is much nearer to the load than to the balancing weights. The classical examples are the Rom. and Dan. steelyards. Platform scales and weighbridges have a compound system of such levers and modern heavy capacity scales can be fitted with very accurate dial indicating and recording mechanisms.

**Weight Lifting**, athletic practice of raising a weight, usually a metal bar and disks. See under **OLYMPIC GAMES**.

**Weights and Measures.** In order to measure any quantity of length, time, mass, etc., it is necessary first of all to fix on a definite quantity of the same kind and call this the unit of measurement. The unit selected, any other quantity will be measured by the number of units it contains. The concrete representation of a unit is termed the 'standard.' In the Eng., or foot-pound-second system, the unit of length is the ft., a ft. being one-third of a yard. The yd. is defined as the distance between two plugs of gold sunk in a bar of platinum which is kept in the Exchequer offices, London, at a temp. of 62° F. This is the standard yard. Experiments have been made to fix a more accurate standard dependent upon the length of the wave of light produced by a cadmium filament. The standard yd. is not big enough for all purposes, and so the m. (= 1760 yds.) is used for the measurement of greater lengths. Similarly, for some purposes it is not small enough, and hence the yd. is further subdivided to ft. and in. The Eng. system, or F.P.S. system, has for units of length, mass and time, the ft., pound, and sec. The unit of time, the mean solar sec., is derived from the average length of the solar day. The unit of mass, the pound avoirdupois, is the mass of a piece of platinum preserved in the Exchequer offices. Eng. commercial measures are arranged at 62° F. in air, the barometer being 30 in. at mean sea-level.

#### BRITISH SYSTEMS

##### MONEY

4 farthings	.	= 1 penny (d.).
12 pence	.	= 1 shilling (s.).
20 shillings	.	= 1 pound (£).
		or 1 sovereign.

Standard gold coin is 22 carats, i.e. is an alloy of 22 parts gold to 2 parts of copper. Silver coins are also of alloy, being made of 222 parts silver to 18 of copper. (In 1946 the existing silver coinage was replaced by one of cupro-nickel.) 'Copper' money is made of bronze (95 copper, 4 tin, and 1 of zinc), the halfpenny being 1 in. in diameter, and three pennies and five half-pennies weighing the same, viz. 1 oz. avoirdupois.

##### LENGTH (LONG MEASURE)

12 inches (in.)	.	= 1 foot (ft.).
3 feet	.	= 1 yard (yd.).
5½ yards	.	= 1 rod, pole, or perch.
40 poles (220 yds.)	.	= 1 furlong (furl.).
8 furlongs (1760 yds.)	.	= 1 mile (m.).
3 miles	.	= 1 league



## Weights

645

## Weights

Additional measures of length are :

1 chain .	=	100 links = 22 yds.
10 chains .	=	1 furlong.
	(Used in land surveying)	
6 feet .	=	1 fathom.
100 fathoms .	=	1 cable's length.
	(For recording depth of soundings)	
6080 ft. .	=	1 knot.
1870 yards .	=	1 nautical mile.
	(For measuring rate of sailing)	
4 inches .	=	1 hand.
	(Used in measuring horses)	

### AREA (SQUARE MEASURE)

144 square inches .	=	1 square foot.
9 square feet .	=	1 square yard.
30½ square yards .	=	1 square pole.
40 square poles .	=	1 rood.
4 roods .	=	1 acre (4840 sq. yds.).
640 acres .	=	1 square mile.

Since 22 yds. = 1 chain, then 484 sq. yds. = 1 sq. chain. Thus a square chain is  $\frac{1}{16}$  part of an acre, or 6400 square chains are contained in a square mile.

### MEASURES OF VOLUME AND CAPACITY

#### Cubic Measure

1728 cubic inches .	=	1 cubic foot.
27 cubic feet .	=	1 cubic yard.

Cubic measure is used for measuring the volume of solids, such as stone, brickwork, and wood.

A marine ton .	=	40 cubic feet.
1 stack .	=	108 cubic feet.
1 cord .	=	128 cubic feet.

For solids such as corn, sand, etc., measures of capacity may be used.

#### Measure of Capacity (Liquid or Dry Measure)

4 gills .	=	1 pint.
2 pints .	=	1 quart.
4 quarts .	=	1 gallon.
2 gallons .	=	1 peck.
4 pecks .	=	1 bushel.
8 bushels .	=	1 quarter.
5 quarters .	=	1 load.
2 loads .	=	1 last.

One gallon of water weighs 10 lb. avoirdupois and contains 277.463 cub. in. In U.S.A. the gallon contains only 231 cub. in., and the other measures are proportionately smaller. The pint of 'liquid measure' is also only about  $\frac{1}{2}$  of the pint of 'dry measure.'

#### Wine Measure

2 pints .	=	1 quart.
4 quarts .	=	1 gallon.
10 gallons .	=	1 anker.
42 gallons .	=	1 tierce.
2 tierces .	=	1 puncheon.
1½ puncheons .	=	1 pipe or butt.
2 pipes .	=	1 tun.

### Ale and Beer Measure

4 gills .	=	1 pint.
2 pints .	=	1 quart.
4 quarts .	=	1 gallon.
9 gallons .	=	1 firkin.
2 firkins .	=	1 kilderkin.
2 kilderkins .	=	1 barrel.
1½ barrels .	=	1 hogshead.
1½ hogsheads .	=	1 puncheon.
1½ puncheons .	=	1 butt or pipe.

Imported wines have varying sizes for the casks, but always 2 hogsheads = 1 pipe or butt, and 2 pipes or butts = 1 tun.

### WEIGHTS

#### Avoirdupois Weight

16 drams .	=	1 ounce.
16 ounces .	=	1 pound.
14 pounds .	=	1 stone.
2 stones (28 lb.) .	=	1 quarter.
4 quarters .	=	1 hundred-weight (cwt.).
20 cwt. .	=	1 ton

In the U.S.A. and Canada the current quarter is 25 lb. and the ton 2000 lb. except for a few commodities, such as bituminous coal and imported goods. By the Weights and Measures Act, 1878, it was enacted that gold, silver, platinum, and precious stones might be sold by troy weight, and drugs might be sold by apothecaries' weight.

#### Troy Weight

24 grains .	=	1 pennyweight (dwt.).
20 pennyweights .	=	1 ounce (oz. troy)
12 ounces troy .	=	1 pound (troy)
1 lb. troy .	=	5760 grains, and 1 lb. avoirdupois = 7000 grains (troy)

#### Apothecaries' Weight

20 grains or minims .	=	1 scruple.
3 scruples .	=	1 drachm.
8 drachms .	=	1 ounce.
12 ounces .	=	1 pound.

From this table 1 ounce = 480 grains. In 1885 the Brit. Pharmacopœia modified apothecaries' weight by ceasing to recognise the ounce of 480 grains, employing in its place the ounce (avoirdupois) of 437½ grains. Thus apothecaries' weight became :

437½ grains .	=	1 ounce.
16 ounces .	=	1 pound.

#### Apothecaries' Fluid Measure

60 minims .	=	1 fluid drachm.
8 drachms .	=	1 fluid ounce.
20 ounces .	=	1 pint (pt. or O).
8 pints .	=	1 gallon (gal., C., Cong.).

**Diamond and Pearl Weight.**—By Order-in-Council, October 1913, the legal Brit. standard is the metric carat of 200 milligrams. Diamond weights are expressed by carats and one-hundredths of a carat (called points). In trading deals the old system of one-grainers, etc. (four grains to carat) or fractional, etc. (four grains to

carat), or fractional references like quarter-carat or half-carat may still find use. For pearls the metric carat is also applicable, but custom lingers, and from small to large pearls are referred to by number of grains, thus, 1, 1½, 2 up to 40 grains or more for exceptionally large pearls.

**MEASURES OF TIME, see under TIME AND TIME MEASUREMENT.**

**ANGLE MEASURE.**—The magnitude of an angle is generally expressed in circular measure for scientific purposes. The unit of circular measure, the radian = the angle subtended at the centre of a circle by an arc equal to the radius. To convert degrees to radians the following formula is employed:  $\frac{\theta}{360^\circ} = \frac{\theta^r}{2\pi}$  where  $\theta$  = the angle

in radians,  $\theta^\circ$  = the angle in degrees, and  $\pi = 3.1416$ .

60 seconds (") = 1 minute (')  
60 minutes = 1 degree (°)  
90 degrees = 1 right angle.

#### PAPER MEASURE

24 sheets = 1 quire.  
20 quires = 1 ream.  
2 reams = 1 bundle.  
10 reams = 1 bale.

**PHYSICAL MEASUREMENTS.**—These are made both by using the units of the Brit. or F.P.S. system, or by the use of the C.G.S. system. In the latter the units of length, mass, and time used are the centimetre, gramme, and second. These are fundamental units from which various absolute units are derived (see PHYSICAL UNITS).

(For the metric system see METRIC SYSTEM.)

**LAW OF WEIGHTS AND MEASURES.**—The Act of 1878 was the prin. Act, amendments being made by the Acts of 1889, 1892, 1897, 1904, 1926 and 1936. Section 1 of the Act of 1897 declares legal the use of metric weights and measures for all purposes. Every W. and M. must have its denomination stamped on the top or sides in legible figures and letters, and every measure of length (Weights and Measures Act, 1904) or capacity must have the denominations stamped outside it. Inspectors are appointed by local authorities to inspect weights and measures, but an inspector may not act unless and until he has passed an examination and obtained a certificate of qualification (for the fees for verification and stamping W. and M. see Order in Council, April 26, 1920, Fees (Increase) Act, 1923, and the Weights and Measures Act, 1926). The Board of Trade, among other statutory powers respecting W. and M., has powers over instruments for measuring gas (Gas Regulation Act, 1920). The Broad Act of 1836 made bread saleable only by weight, except in the case of Fr. and fancy bread or rolls; but under the amending Act of 1926 bread may not be sold otherwise than by net weight (though selling without weighing at the time of sale is not made an offence). Under the Corn Sales Act, 1921, the Corn Returns Act, 1882, is

amended and provision is made for the sale of cereals by weight in terms of the hundredweight of 112 imperial standard pounds. Herring barrels or half barrels must be of 26½ imperial gallons and 13½ imperial gallons respectively in England and Wales if they are presented for the gov. brand at any place at which the Herring Fishery (Branding) Act, 1913, is in force. The Sale of Food (Weights and Measures) Act of 1926 prescribes penalties for selling short weight, measure or number, or for misrepresentation as to weight or measure, etc., or for mis-statements on pre-packed articles as to weight, etc. Except so far as it applies to pre-packed articles, this Act applies only to retail dealings. Frauds in connection with weighing goods sold in markets or giving false information to a market officer to evade payment of any toll or other charge are punishable under the Food and Drugs Act, 1938. The Weights and Measures Act, 1936, enacts that sand or ballast shall not be sold otherwise than by weight or by the cubic yard. The Acts of Parliament referring to weight, measures, and coinage may be seen at the Brit. Museum, and, as a rule, in public libraries, assize courts, etc., and a 'Chronological Table and Index to the Statutes' may be obtained from His Majesty's Stationery Office.

See A. J. Martin, *Tables of Weights, Measure and Coinage*, 1904; G. A. Owen, *Law Relating to Weights and Measures*, 1947; and *Stone's Justices' Manual*, vol. 2, Part V, 'Weights and Measures' (82nd ed.), 1950.

**Weil's Disease, see under JAUNDICE.**

**Weimar**, city of Germany, formerly cap. of the grand duchy of Saxe-Weimar, now cap. of Thuringia on the l. b. of the Ilm, 13 m. E. of Erfurt. It is justly famous, having been at one time the residence of the most illustrious men of letters in Germany (e.g. Goethe, Schiller, Herder and Wieland) under the patronage of the Duke Charles Augustus. In Feb. 1919 the Constituent Assembly met in W. to draw up the Republican Constitution of Germany. (See GERMANY) The tn. is chiefly a residential and tourist centre, though there are some industries, including textiles and engineering. Pop. 49,300.

**Weimar** (state), see SAXE-WEIMAR-EISENACH.

**Weinberger, Jaromír** (b. 1896), Czech composer, b. in Prague. His famous opera, *Schvanda the Bagpiper*, was produced in Prague in 1927. With its fine polyphonic overture and exuberant fantastic ballets, it recalls Smetana's work.

**Weinheim**, tn. in Württemberg-Baden, Germany, 10½ m. E.N.E. of Mannheim in the wine dist. of the Odenwald. It manufs. furniture, machinery, leather, and rubber products. It was destroyed by the Fr. in 1688. Pop. 17,500.

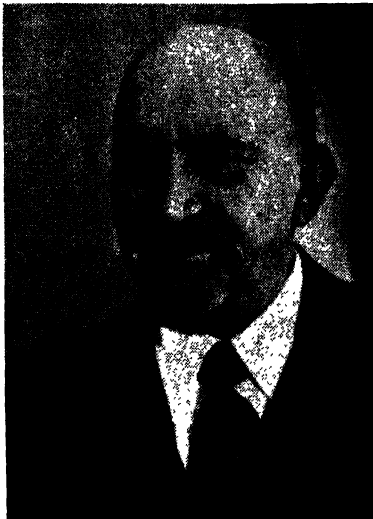
**Weir, see under RESERVOIRS; RIVER ENGINEERING.**

**Weissenfels**, tn. of Saxony-Anhalt, Germany, 16 m. S.W. of Leipzig. The church of St. Mary dates from 1303, and there is the former residence of the dukes

of Saxe-W. Footwear, paper, nails, and chains are produced. Pop. 49,100.

**Weisshorn**, 14,800 ft., mt. of the Swiss Alps, canton Valais, between Randa in the Zermatt valley and Zinal to the W. It is noted for its symmetrical beauty of form. The first ascent was by Tyndall in 1861.

**Weizmann, Chaim** (b. 1874). Zionist leader and chemist, b. at Motol, one of the Jewish 'pales' in Grodno, Russia. Educated at Pinsk and at the univ. of Berlin and Freiburg, he became lecturer in chem. at Geneva and reader in biochemistry at Manchester Univ. in 1904. In the First



Israeli Legation

DR. CHAIM WEIZMANN

World War he was appointed director of the Admiralty laboratories engaged in research work on behalf of the War Office. It was during this period that he made the brilliant discovery of a process for the manufacture of acetone, the basis for high explosives. So valuable were his services to the Allied cause that a colony known as the Colony of David was founded in Palestine in his honour. Between 1917 and 1930 W., as President of the World Zionist organisation, was mainly responsible for the political relationship between the Colonial Office and the Jewish Agency in Palestine (see *under* ZIONISM). From 1935 to 1946 he was president of the World Zionist organisation and became chairman of the Hebrew univ. at Jerusalem in 1932. Throughout, W. has stood for co-operation between the Jewish people and Great Britain in the development and the up-building of Palestine, with the ultimate ideal of a Jewish Commonwealth in

Palestine. He became president of the Provisional Council of Israel in 1948, and was sworn in as first president of Israel on Feb. 17, 1949. His autobiography, *Trial and Error*, was pub. in 1949.

**Welsh Fusiliers, The Royal.** A number of companies were raised in 1686 in the Welsh marches and in 1689 these were regimented and later numbered 23rd Foot. The regiment served under William III. in Ireland and at Namur, and distinguished itself under Marlborough at Blenheim, Ramillies, Oudenarde, and Malplaquet. On returning home the W. F. received the title 'Prince of Wales's Own Royal Regiment of Welsh Fusiliers.' It fought under George II. at Dettingen, and is one of the select few 'Minden' regiments. Further laurels were gained under Wellington in the Peninsula and at Waterloo, and more in the Crimean War, Indian Mutiny, S. Africa, and China. It raised forty-two battalions during the First World War, which served in France, Flanders, Italy, Macedonia, Gallipoli, Egypt, Palestine, and Iraq. In the Second World War the 1st and 2nd battalions served in Burma; the 4th, 6th, and 7th fought in the liberation of Europe. The king is colonel-in-chief.

**Welsh Regiment.** Formerly 41st and 69th Regiments. The 41st was raised in 1719 as a regiment of invalids and was composed of out-pensioners of Chelsea Hospital. In 1787 it became a regiment of the line. The duke of Wellington was in the regiment for a time. It served in the West Indies and Canada frontier campaign of 1812-14, and later in Afghanistan and Crimea. The 69th was raised in 1756 as a second battalion of the 24th (S. Wales Borderers), but became a single regiment in 1757. It served in America and Gibraltar as marines, and as infantry at Waterloo. Both regiments were linked in 1881. During the First World War the regiment raised thirty-four battalions and served in France, Flanders, Macedonia, Gallipoli, Egypt, Palestine, and Mesopotamia. In the Second World War the W. R. fought on the W. front in 1944-45, taking part in all the great battles from the landing in Normandy to the Rhine crossing and beyond.

**Weld, Woold, Dyer's Rocket, or Greenweed** (*Reseda luteola*), tall plant (family Resedaceae) with racemes of yellow flowers. It occurs on chalky soils and was formerly grown to furnish a yellow dye.

**Welding**, localised union or consolidation of metals. The process is usually employed to unite metals of the same composition where the maximum strength is of paramount importance. There are various processes, as follows. (i) *Pressure Forge Welding*. This is the oldest known process of W. The pieces to be welded are heated to a plastic condition and united by hammering at pressure. The amount of hammering and pressure is dependent upon the mass of the parts to be joined. (ii) *Pressure Resistance Welding*, in which the surfaces to be joined are

heated to a plastic condition by passing heavy electrical current through the joints, accompanied by mechanical pressure to unite them. This process includes the types: butt-flash, wherein a butt joint is pressed together; seam, wherein the weld is made linearly; and spot, wherein the fusion is made in one or more spots. (iii) *Pressure Thermit Welding* is another plastic process but it differs in that the heating is derived from a chemical reaction (see also *Thermit Welding* below). (iv) *Gas Welding*, is a non-pressure fuse process in which the heat is supplied by the combustion of suitable fuel gases with atmospheric and pure oxygen. The fuel gas and oxygen are mixed and regulated through a blow-pipe. The gases most commonly used are oxygen, and acetylene, oxy-hydrogen, oxy-coal gas; other combustible gases are used to some extent. In this form of W. the heat is supplied by oxy-acetylene flame. Fusion is made by melting the edges of the base metal into a molten puddle and adding a suitable filler rod, resulting in its complete fusion with the base metal. (v) *Arc Welding* is a non-pressure fusion where the surfaces to be joined are fused by the heat of an electrical arc. The most common form is known as metallic arc W. In this process the arc is struck between a metal electrode and the work. The heat of the arc fuses the work and the electrode; the fused electrode deposit unites with the fused base metal to form the welded joint. (vi) *Thermit Welding*—(non-pressure) is a fusion process originating from a discovery made in Essen in 1900 by Dr. Hans Goldschmidt. He found that if a mixture of iron oxides and finely powdered aluminium were ignited, the two materials would react in such a way as to form two new materials, a superheated mass of the metal itself and a slag composed of aluminium oxide. He later determined the most suitable type of iron oxide ( $\text{Fe}_2\text{O}_3$ ) and its fineness, as well as the addition of such elements as chrome, nickel, vanadium, and manganese in thermit steel mixtures. In the thermit process the parts to be joined are placed at a distance apart determined by their size. A sand mould is formed around the parts consistent with the shape of reinforcement desired, provision being made for pourer gates. Heat is applied to dry out the sand mould and to bring the parts to be joined to a red heat. A thermit mixture is then placed in a crucible supported over the pouring gate and is then ignited. In approximately half a minute, the reaction is complete and the thermit steel is tapped from the bottom of the crucible into the pouring gate. The superheated metal permeates between and around the parts to be joined, thoroughly combining with their surfaces and welding them into a homogeneous mass, while the molten aluminium slag flows over into a basin at the top of the mould.

See J. H. Child, *Principles of Electric Arc Welding*, 1940; A. L. Coker and E. Molloy, *The Welding Engineer's Pocket Book*, 1941; A. C. Davies, *The Science*

*and Practice of Welding*, 1941; W. Helgh, *The Practice of Arc Welding*, 1942; F. Koenigsberger, *Design for Welding*, 1948; and A. R. Moon, *Design of Welding Steel Structures*, 1948.

**Weldon, Walter** (1832-1885), Eng. chemist, b. in Leicestershire. See under CHLORINE, *Weldon's Process*.

**Well, see** GULPHS and GHIRELLINES.

**Welfare, see** INDUSTRIAL WELFARE and SOCIAL SERVICE.

**Welfare State**, state which gives practical expression to its obligations to its citizens in an integrated system of social service or social insurance. Two good instances of the more or less completely developed W. S. are the United Kingdom and New Zealand. See also SOCIAL INSURANCE; SOCIAL SERVICE.

**Welhaven, Johann Sebastian Cammermeyer** (1807-73), Norwegian poet and critic, b. at Bergen. In 1838 he settled in Christiania and lectured on Scandinavian literature. As a poet he ranks with the great originators. He attacked the style of Wergeland (q.v.) and gave the impetus to literary forms which have shaped modern Norwegian letters and contributed to the rise of Ibsen, Hamsun, etc. From 1839 to 1868 he was prof. of philosophy at Christiania. His works include *Digte Kunst og Polemik* (1832); *Norges Dæmring* (1834); *Digte* (1839); *Nyere Digte* (1845); *Reisebilleder og Digte* (1851); *Om Ludvig Holberg* (1854); *Skildringer* (1860); *Samlede Skrifter* (collected works) (1867-68). See Eng. trans. of some of his poems in J. Dahl, *Norwegian and Swedish Poems* (1872). See lives by G. Gran, 1922, and J. Handagard, 1926, and Sir E. Gosse, *Studies in the Literature of Northern Europe*, 1879.

**Well, see** ARTESIAN WELLS, BORING, WATER SUPPLY.

**Welland**: 1. Tn. in Welland co., Ontario, Canada. It is on the W. riv. and canal, has important fruit-shipping trade, and manufs. iron castings, tubes, structural iron, and steel, twine and rope, cotton, and flour. Pop. 15,800. 2. Riv. of England, rises on the boundary between Northamptonshire and Leicestershire, and flows N.E. to the Wash, which it enters 9 m. below Spalding. It is navigable to Market Deeping, and has a length of 70 m. By 1952 about £1,500,000 will have been spent on the riv., mainly in duplicating the channel that runs through the 'bottleneck' at Spalding and in strengthening the bank by steel piling to avoid flooding.

**Welland Ship Canal** (1824-29) between Lake Ontario (Port Weller) and Lake Erie (Port Colbourne) runs parallel with the Niagara R. By the enlarged route (completed 1888) it is 26½ m. long, 14 ft. in depth, 200 ft. wide, and by means of twenty-six locks rises 326½ ft. The W. S. C. begun in 1913, and was opened to ships on April 21, 1931, construction, however, still being carried on for the purpose of excavating the canal to a uniform depth of 25 ft. There are seven lift locks having dimensions of 800 ft. by 80 ft. Some 12,000,000 tons of cargo are carried in the eight-month season.

**Welles, (George) Orson** (b. 1915), Amer. actor and theatrical and film producer, b. at Kenosha, Wisconsin, and educated at Woodstock, Illinois. W. became famous as a film director after his production of 'Citizen Kane,' in which he also acted. This film, with its experiments in photography did much to revolutionise screen technique.

**Welles, Sumner** (b. 1892), Amer. politician, b. in New York, and educated at Groton and Harvard. He entered the diplomatic service in 1915. From 1937 until 1943 he was under-secretary of state, when he resigned, supposedly over a disagreement with official U.S. policy. W. was an efficient administrator and a diplomat who showed strong sympathies towards Britain: in 1940 he went as Roosevelt's personal envoy to Rome, Berlin, Paris, and London.

**Wellesley, Arthur**, see WELLINGTON, DUKE OF

**Wellesley, Henry Richard Charles**, see COWLEY, EARL.

**Wellesley Province**, see PROVINCE WELLESLEY.

**Wellingborough**, mkt. tn. and urban dist. of Northamptonshire, England, on the Nene, 10 m. N.E. of Northampton. It is a centre for footwear and for agriculture. Iron is mined and foundries are worked. Pop. 30,000.

**Wellington, Arthur Wellesley**, first Duke of (1769-1852), Brit. soldier and statesman, third son of Garrett W., first earl of Mornington, b. at Upper Merion Street, Dublin, and educated at Eton, and later at Pignerol's Military Academy at Angers. He entered as an ensign in the 73rd Regiment in 1787, and then for a few years sat as member for Trim. He commenced his military command at the head of a brigade in Holland in 1794. It was in India as a colonel in the war against Tippon that he first gave signs of a transcendent military genius. After being left in command of the troops at Mysore, he baffled Napoleon's Oriental plan of a descent on S. India from Egypt as a base, by invading Mysore and destroying or scattering the 40,000 followers of Dhoondyah Waugh before Fr. forces could be sent there. In 1803 he was appointed chief political and military agent in the Deccan and the S. Mahratta states, and on the fresh outbreak of trouble with the native chiefs, Sindiah and Holkar, he added to his reputation by the signal defeat of an overwhelming force at Assaye. Though he received the thanks of Parliament and was knighted for his services, he does not appear to have been satisfied with either his treatment or his prospects: he resigned his command and appointment in the early part of 1805, and shortly afterwards sailed for England.

In 1806 he was returned as member for Rye, and a year later became chief secretary for Ireland and a privy councillor, but on the threat of a Fr. invasion he was soon in active service again. After a short campaign in Denmark, which ended in the complete humiliation of the Danes, he was sent to Spain. He landed

at Corunna in July 1808, but, not being in sole or chief command, was almost immediately involved in difficulties with incompetent rivals like Dalrymple and Burrard, much in the same way that his genius was thwarted in India by persons whose social status was in advance of their military capacity. In 1809 he returned to England and resigned, but was afterwards sent out in sole command, and from that point onward began a series of splendid victories which culminated in the complete evacuation of Portugal and Spain by the Fr. For long ill-supplied with men and materials, W. defeated a succession of Fr. marshals and proved to Europe that Napoleon's military system was not invincible. Though not of a character to win deep affection, he gained the profound respect of his troops; he displayed the highest strategical and tactical qualities and a fine control of supply and organisation. (See PENINSULAR WAR.)

In 1815, loaded with honours, W. was ambas. to the restored Bourbon court, and Brit. representative at the congress of European Powers at Vienna, when news came of Napoleon's escape from Elba. There followed his best-known campaign, that of Waterloo (q.v.). Returning to England, he was granted £200,000 for the purchase of the estate and mansion of Strathfieldsaye in Hants. In 1818 he recommenced his political career, a staunch Tory, becoming Prime Minister in 1828. He carried through the Rom. Catholic emancipation, but resigned in 1830, refusing to agree to electoral reform. He was foreign secretary under Peel (1834-5) and minister without portfolio (1841-6), supporting Peel's repeal of the corn laws. He died at Walmer Castle, and was buried in St. Paul's Cathedral by the side of Nelson. See his *Despatches* ed. by J. Garwood, 1837-45; and *Letters (A Great Man's Friendship)*, ed. by Lady Burghclere, 1927; see also C. O. Head, *Napoleon and Wellington*, 1939; and lives by Sir H. Maxwell, 6th ed., 1907; J. W. Fortescue, 1925; P. Guedalla, 1931; M. Wellesley, 1937; T. Lücke, 1939; J. Chaatenet, 1945; and C. Aldington, 1946.

**Wellington:** 1. Tn. in Shropshire, England, 10 m. E. of Shrewsbury, at the foot of the Wrekin, in an agric. dist. The public school of Wrekin, founded in 1880, is near W. Pop. 12,500. 2. Tn. in Somerset, England, with manufs. of furniture and woollen goods. The duke of Wellington took his title from this place, and on the summit of the Black Downs is a monument to his memory. S. of the tn. is Wellington School, a public school for boys, founded 1841. Pop. 7100. 3. Tn. of New S. Wales, Australia, in Wellington co., on the Macquarie R., 65 m. N.N.W. of Bathurst. The dist. is agric., cattle and sheep are reared, and fruit, wheat, onions, vines, etc., are cultivated. There are valuable gold deposits in the neighbourhood. The W. caves contain interesting fossil remains. Pop. 4400. 4. Tn. of Cape Prov., S. Africa, about 50 m. N.N.E. of Cape Town, not far from Bain's

Kloof pass. It began as a Huguenot settlement and the Huguenot College has made W. known all over S. Africa. W. was once the most N. terminus of the Cape Colony's Railway. Pop. European 2900, Coloured, 3800.

**Wellington**, cap. of New Zealand, in the prov. of the same name in the N. Is., bounded by Cook Strait to the S. The city was founded in 1840, as Britannia, by Gibbon Wakefield. W. lies at the geographical centre of the dominion, and close to its centre of pop. It has an excellent harbour and good means of communication with all parts of the dominion

scripton as a memorial to the duke of Wellington, for the education of the sons of deceased officers, and was incorporated by royal charter in 1853. After 1879 fee-paying pupils from outside were later admitted, but 60 foundation scholarships are reserved for deceased officers' sons, and a certain number of serving or retired officers' sons are received at slightly reduced fees. There are some 600 pupils.

**Wellingtonia**, see *SFOQIA*.

**Wells, Herbert George** (1866-1946), Eng. novelist and writer, b. at Bromley, Kent, youngest son of Joseph W., ex-gardener, general dealer, and professional



*High Commissioner for New Zealand*

#### WELLINGTON, LOOKING TOWARDS MOUNT VICTORIA

In the middle of the picture, following the water-front, is the business area of the city.

As the result of its situation, and as the seat of gov., W. has become the headquarters of the chief commercial institutions and possesses many handsome buildings. The harbour is the prin. port of the dominion for the shipment of wool, frozen meat, dairy produce, apples, and other exports, and a large proportion of the dominion's imports arrive through W. The city is the seat of Victoria Univ. College and amongst its more important buildings are Parliament Buildings, Government House, the war memorial, art gallery, and museum, and a very modern municipal library, as well as numerous large commercial buildings. Pop. (metropolitan area) 186,100. See A. Mulgan, *Centennial Survey*, 1940.

**Wellington College**. Eng. public school at Crowthorne, near Wokingham, Berkshire. It was founded by public sub-

scription as a memorial to the duke of Wellington, for the education of the sons of deceased officers, and was incorporated by royal charter in 1853. After 1879 fee-paying pupils from outside were later admitted, but 60 foundation scholarships are reserved for deceased officers' sons, and a certain number of serving or retired officers' sons are received at slightly reduced fees. There are some 600 pupils.

In 1884 he went to London for three years on a science studentship, going to the Normal School of Science at Kensington, the life at which is touched on in

his *Ann Veronica*, a novel which was a notable contribution to the cause of women's emancipation. He became later assistant master at Holt, near Wrexham but was rendered semi-invalid by a football accident. From 1887 he taught at Kilburn for two years. He took the degree of B.Sc. (1st class honours) at London Univ. in 1890. He was tutor for two years at the Univ. Correspondence College; there he met Amy Catherine Robbins, who became his wife. He broke a blood-vessel in his lungs (1893), and was

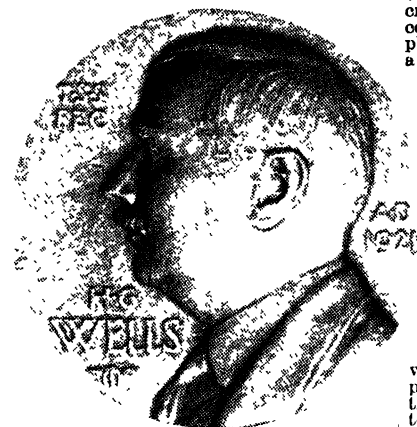
are *Love and Mr. Lewisham* (1900); *Kippis* (1905); *Mr. Polly* (1910); and *Marriage* (1912). W. was a Fabian; he was more than a mere social regenerator; he was a prophet of world organisation, whether in such fiction as *Mr. Britling Sees it Through* (1916), or *The World of William Clissold* (1926), or in non-fictional works like *God the Invisible King* (1917); *Outline of History* (1920, definitive ed., 1923); *Short History of the World* (1922); and *Short History of Mankind* (1925).

W.'s ruling theme was the need for man to impose his mastery upon his own creations; and, in pursuance of this concept, he became a leading advocate of planning. Yet, though in the capacity of a worker in the cause of human progress

he achieved world-wide fame and some measure of assent, his predictions were sometimes hard to reconcile with his own message. W. used literature to express his views on social or other institutions and only secondarily as a craftsman and artist. But he could write with delicacy and rare verbal felicity, as, e.g., in *The Country of the Blind* (1911), which is generally admitted to be one of the best short stories in the language.

*The Outline of History* (1920) was an ambitious attempt to illustrate the continuity of hist. from the beginnings of life to the treaty of Versailles, a fine if characteristically mannered popularisation of novel educational value. It was the first vol. in a trilogy planned to popularise the historical, scientific, and sociological ideology appropriate to the task of creating a World State. The succeeding two vols. were *The Science of Life* (1929), written in collaboration with Dr. Julian Huxley and his son, G. P. Wells, and *The Work, Wealth and Happiness of Mankind* (1932). *Experiment in Autobiography* was pub. in 1934. See life by G. West, 1930 (the fullest biography, with an introduction by H. G. Wells and a full bibliography); and P. H. Doughty, *H. G. Wells: Educationist*, 1926.

**Wells**, city, bishop's see, parl. and municipal bor. in the co. of Somerset. Its hist. begins in Saxon times, and Ina, king of Wessex, is said to have founded its first church in 704. The cathedral, of the diocese of Bath and Wells, was begun in the late twelfth century, and the central parts of the building—transepts, E. bays of nave and W. bays of choir—are in the Transitional Norman style of that period. Jocelin, bishop from 1206-42, built the rest of the nave, the W. front and the N. porch, all superb examples of Early Eng. architecture. The E. end and the central tower belong to the early fourteenth century, and the W. towers to the early fifteenth. The W. front, with its collection of 350 statues is unrivalled in this country. The cathedral is also famous for its lady chapel and crypt, the choir and chapter house, and its beautiful fourteenth-century stained glass. The bishop's palace, built by Jocelin, is moated and surrounded by a defensive wall. Other subordinate buildings include the



H. G. WELLS

A bronze portrait medal by T. Spicer-Simson.

forced, but probably not against his will, into authorship.

His first real literary success was in 1891 when Frank Harris accepted his 'The Rediscovery of the Unique' for the *Fortnightly Review*, and this was followed by some scientific essays in the *Gentleman's Magazine*. At this period, too, while lecturing and coaching, he wrote some books on biology and physiology. While recuperating at Eastbourne he wrote a sketch, 'On the Art of Staying at the Seaside,' which appeared in the *Pall Mall Gazette*, to which he became a regular contributor. From 1894 he was at work on a story which became *The Island of Dr. Moreau* (rejected at its first offer) and then completed *The Wonderful Visit*. His first won nationwide recognition with his *War of the Worlds*, which was serialised in the *Windsor Magazine*. His earlier novels are scientific romances. In these he estab. an original type of story evolved from a combination of scientific facts, highly-coloured with imagination and frequently told as of the future. His social-science novels are of a different order. They are novels about middle-class problems and reveal great insight into the complexities of the marriage problem. The best of these

fifteenth-century Deanery and the delightful Vicar's Close. W. has manufs. of paper, brushes, textiles, and there are agric. markets. Pop. 6000.

**Wells, Sacred**, have been centres of worship and religious magic from the earliest times. During the Middle Ages the intervention of some saint was generally substituted for that of the original water-deity. Famous Brit. wells are those at Tissington, Derbyshire, of St. Winifred (Holywell), St. Chad (Lichfield), St. Anthony (Maybole), St. Keyne (Cornwall), St. Eilian (Denbigh). Of particular interest is the sacred spring of Coventina and her temple at Carru-burgh on the Rom. Wall, and the hot springs of the goddess Sulis at Bath.

**Weisbach, Carl Auer, Baron von** (1858-1929), Austrian chemist, b. in Vienna, chiefly remembered as the inventor of the incandescent gasmantle (see INCANDESCENT LIGHT), which he put on the market in 1885.

**Welsh Art**, see under WALES.

**Welsh Cattle**, see under CATTLE.

**Welsh Corgi**, small Welsh cattle-dog; the advantage of its small size is that cattle are unable to get their horns low enough to harm it. There are two distinct varieties, the Pembroke and the Cardigan.

**Welsh Fusiliers**, see WELCH FUSILIERS, THE ROYAL.

**Welsh Guards**. Formed on Feb. 26, 1915, on a cadre of Welshmen in the Grenadier Guards. The then Prince of Wales was first colonel of the regiment and the king is colonel-in-chief. Their motto is 'Cymru-Am-Byth' ('Wales for Ever'). Two battalions were raised which served during the First World War in France and Flanders, the first battle being Loos. Other outstanding actions in which they participated are: Ginchy, Flers-Concelette, Morval, Pilekem, Poelcappelle, Cambrai, 1917-18, Bapaume, 1918, Canal du Nord, and the Sambre. In the Second World War the W. G. served in N.W. Europe and in Italy. Detachments were part of the Guards Armoured Div. in France (1944-45) which crossed the Orne into the Caen plain and subsequently fought in the battles for the Rhine and beyond.

**Welsh Harp**, harp having three rows of strings; the two exterior were tuned in unison diatonically, the inner row giving the extra sounds required to complete the chromatic scale.

**Welshing**, see under LARCENY.

**Welsh Language and Literature**, see under WALES.

**Welsh Mountain Breed**, see under SHEEP.

**Welshpool**, bor. of Montgomeryshire, Wales, 15 m. S. of Oswestry, on the R. Severn and Shropshire Union Canal. It is the second largest bor. in Great Britain, is an important agric. centre for a wide area, and has one of the largest mrkts. in Wales. Pop. 6000.

**Welsh Springer**, see under SPANIEL.

**Welsh Terrier**, small terrier of about 20 lb. in weight. Its colour is black and tan, or black, grizzle, and tan, and except for this it strongly resembles the wire-haired fox terrier, though its skull is slightly

wider between the ears. The breed is eminently suitable as a small house dog and companion.

**Welwyn Garden City**, tn. of Hertfordshire, England, situated 21 m. N.N.W. of London. It has over eighty industries, mostly food and light engineering; and was the second of Howard's garden cities, estab. in 1920 by him, Sir Theodore Chambers, C. B. Purdom, W. T. (later Lord) Layton, and others associated in a joint stock company formed on a limited dividend basis. The tn. was planned for a pop. of 40,000 as a satellite tn. to provide for the decentralisation of pop. and industry from London; the original pop. on the entire estate was 400. The company survived many difficulties mostly due to lack of cap., and became well estab. with considerable resources by its successful development of land and subsidiary enterprises. In May 1948, the minister of town and country planning made an order under the New Towns Act (1946), establishing a development corporation to take over the tn. and to complete it, having reduced the ultimate pop. to 36,500. Many experiments of public interest were undertaken in the tn., the most important of which was the Welwyn Stores, which is the tn.'s main shopping centre. For a detailed historical and factual account see C. B. Purdom, *The Building of Satellite Towns*, 1925, 1949. Pop. 18,500.

**Wembley**, municipal bor. forming two parl. divs. of Middlesex, England, near Harrow-on-the-Hill, on the Brent. In 1924-25 the Brit. Empire Exhibition was held at Wembley and the Empire Stadium, built to hold 100,000 people, is used for the Football Association and Rugby League Finals. The Empire Pool and Sports Arena is the venue of ice hockey, boxing, and other sports, and many events of the 1948 Olympic Games were held at the stadium and at the pool and sports arena, including the opening and closing ceremonies. Greyhound and speedway racing are also carried on. The bor. is chiefly residential, but there are industries, including electrical, chemical, aircraft, and motor manufacturing. Pop. 133,900.

**Wemyss**, par. in Fife co., Scotland, on the firth of Forth, S.W. of Leven and N.E. of Kirkcaldy, includes the burgh of Buckhaven and Methil (pop. approx. 24,000). The dists. of W. Wemyss, E. Wemyss, Coatdown, and Methilhill are situated within the boundary of the par. and are all engaged in the coal-mining industry. Buckhaven and Methil have large docks, from which coal is exported. At E. Wemyss is situated the ruins of MacDuff Castle, once occupied by Mary, Queen of Scots. Pop. (par.) 34,000.

**Wenceslaus, or Wenzel, Saint** (d. 935), duke of Bohemia. Being converted to Christianity, he endeavoured to make his people also Christians, and was assassinated by his brother in consequence. He was regarded as the patron saint of Bohemia, and he is the 'Good King Wenceslas' of the carol.

**Wenchow**, former treaty port of China, in the prov. of Chekiang. It is a walled



tn., and has manufs. of paper, silk, etc. Pop. 215,800.

**Wendover**, tn. of Buckinghamshire, England, 5 m. S.E. of Aylesbury. The church, containing much thirteenth century work, possesses a fine fourteenth century tower. Pop. 1900.

**Wends**, people belonging (like the Poles and the Czechs) to the N.W. group of the Slavonic peoples. They speak a Slavonic language (see under INDO-EUROPEAN LANGUAGES), and, being Catholics, they employ an alphabet of Latin origin (not Cyrillic). Though few in number (c. 150,000), and entirely surrounded by Ger. speakers in the heart of the pre-war Reich, they have maintained their identity, their customs, language, and literature. Nowadays, the W. occupy a ter. of c. 1200 sq. m. on the upper Spree (Cottbus and Bautzen), known as Lusatia, but in the sixteenth century they were a powerful people, inhabiting the region extending from the Elbe to the Vistula, and from the Baltic to Bohemia.

**Wenlock**, municipal bor. of Shropshire, on the R. Severn, 12 m. S.E. of Shrewsbury. The chief buildings are the sixteenth century Guildhall which contains some beautiful oak carving, the church of Holy Trinity, and the ruins of Wenlock Abbey. W. is an agric. centre. Coal and iron are also mined, and limestone is quarried. Pop. 14,600

**Wenlock Beds**, series of rocks belonging to the Upper Silurian age. To it belongs Dudley Limestone, a fossiliferous Silurian limestone chiefly developed near the tn. of Dudley.

**Wenning, Pieter** (1874-1921), S. African artist. Although his ambition to become an artist was opposed by his family, he went to S. Africa in 1906 and worked in bookshops, eventually becoming a professional artist in 1916 with the assistance of friends. In a short but full career he produced sev. hundreds of paintings and drawings, and is now regarded as one of the founders of contemporary S. African art.

**Wensleydale**, in the N. Riding of York shire, England, that part of the valley of the Ure beginning near Jervaulx Abbey and continuing until near the source of the riv. in Lunds. It is remarkable for its beauty and historical associations. Wensley, at a point where the riv. is crossed by a fifteenth-century bridge, has a fine mid-thirteenth-century church. Middleham Castle dates from the thirteenth century; and Bolton Castle, a fourteenth-century fortified mansion built by Richard 3d Scrope, was where Mary Queen of Scots was imprisoned in 1568. W. gives its name to a breed of long-woolled sheep, and a make of cheese—now produced in cheese factories. See Ella Pontefract, *Wensleydale*, 1936.

**Wensleydale Peerage**, Eng. peerage called after Sir James Parke, Baron Wensleydale, a judge of the court of exchequer, who was created a life-peer in 1856. The House of Lords protested that the privilege of the crown to elect life-peers had fallen into disuse, and it revived the hereditary peers might at the

wish of the crown be outnumbered in the House by life-peers. Wensleydale was accordingly created a peer in tail male. Since then a certain number of Lords of Appeal in Ordinary have been created official life-peers.

**Wensleydale Sheep**, see under SHEEP.

**Wentworth, Charles Watson**, see ROCKINGHAM, MARQUESS OF.

**Wentworth, Thomas**, see STRAFFORD, EARL OF.

**Wentworth, William Charles** (1793-1872). Australian statesman and newspaper-owner, b. in Norfolk Is. He became the first native Australian champion of civil and political rights and was known as 'the Australian patriot.' He practised law in Sydney, and in 1824 started the *Australian*, the first privately-owned newspaper in Australia. In it W. supported the political enfranchisement of 'emancipists' or ex-convicts at the expense of 'exclusivists', or voluntary immigrants, officials, and others. W. pioneered in the struggle to obtain for N.S. Wales the rights and privileges generally accorded to settlement colonies. One of the leading advocates of representative gov. for New S. Wales, his agitation led to the recall of Governor Darling (1833) and, sev. years later, to the passing of the Colonial Act (1840) which gave colonial self-gov. to Australia. W. founded Sydney univ. in 1852.

**Wenzel**, see WENCESLAUS.

**Weregild**, in Anglo-Saxon times, a money compensation for murder or manslaughter. Every man's life had a fixed pecuniary value called the W., the amount graduated according to the rank of the person slain. The W. of a murdered freeman was payable as compensation to his kin; that of a serf was paid to his master.

**Werenskiold, Erik** (1855-1938), Norwegian painter, was one of a group which included Harriet Backer (1845-1932) and Gerhard Munthe (1849-1928) which absorbed the new impressionism in Munich and Paris. A prolific worker, he excelled in portraiture, his secret being the injection of realist psychology into portraits which had first-rate draughtsmanship and exquisite colour sense for foundation, with the result that a new biographical-portrait form was achieved. Notable examples are those of Hendrik Ibsen, which is world-famous, and Bjørnstjerne Bjørnson (National Gallery, Oslo). W. was also famous as a black-and-white artist.

**Werfel, Franz** (1890-1945). Austrian poet, novelist, and playwright, b. of Jewish stock at Prague, and educated at Prague and Hamburg. He lived chiefly in Vienna from 1918, and went to the U.S.A. in 1940. W. wrote verse, dramatic works, short stories, and novel, largely psychological. One of his most famous novels was *The Song of Bernadette* (1941). See lives and studies by A. Luther, 1922, and R. Specht, 1926.

**Wergeland, Hendrik Arnoldus** (1808-45), Norwegian poet, b. at Christiansand. After passing through Christiania Univ. he pub. a successful dramatic satire which fired the young Ibsen's ambitions. His

friends called him the 'Schiller of Norway.' W. entered the clerical profession in 1829, but in 1843 resigned, the sentiments expressed in a poem entitled *Creation, Man and the Messiah*, being deemed incompatible with his cloth. He studied medicine for some years and pub. a treatise on cholera in 1839, but abandoned that line of work for a literary life. He was appointed assistant librarian at Christiania Univ., given a 'literary pension' in 1839, and in 1840 became keeper of the state archives. His popular influence has continued to this day, being a product of the constant attacks on him by Welhaven (*q.v.*) and his fervent nationalism. He is Norway's patriot-poet and is as much loved for his idealism as for his not conspicuously consistent writings. He is best known for extraordinarily beautiful lyrics; but his other work has often been surpassed. A collected ed. of his works was begun in 1918. See lives and studies by J. Bull, 1915, and A. Laache, 1927-30; also J. Handagard, *Wergeland og Welhaven*, 1915.

**Wergeland, Jakobine Camilla**, see COLLETT.

**Werner, Alfred** (1866-1919), Swiss chemist of Fr extraction, b. at Mülhausen. He held the professorship of chemistry at Zurich from 1893 till 1919, and was awarded the Nobel prize in 1913. His principal contribution to chemistry was his theory of co-ordinate valency, based upon his study of complex metal-ammonia compounds. This theory has been largely incorporated in modern hypotheses as to the nature of valency, and represented remarkable insight into the mechanism of chemical combination.

**Werner, George**, see HOUSSAYE, HENRI.

**Wernigerode**, tn. in Saxony-Anhalt, Germany, at the foot of the Harz Mts., 43 m. S.W. of Magdeburg. It contains the fine castle of the princes of Stolberg-Wernigerode, with its valuable library, and has many old buildings. There are saw-mills and chocolate and chemical works. Pop. 23,300.

**Werther**, see under GOETHE, JOHANN WOLFGANG VON.

**Wesel**, tn. of Westphalia, Germany, at the confluence of the Rhine and the Lippe, 32 m. N.W. of Düsseldorf. It is noted for its trade fair, instituted in 1921, and for manufs. of metal goods, and the production of smoked salmon and other fish. The tn. was heavily damaged in the Second World War. Pop. 24,600.

**Weser**, one of the largest rvs. of Germany, formed by the junction of the Werra and the Fulda, the latter of which rises in the Rhön Mts., in Bavaria. From the junction at Minden the riv. flows towards the N. Sea, into which it falls after a course of 225 m. The lower reaches are canalised, and the riv. is navigable by ocean steamers to Bremerhaven, and by smaller vessels to Bremen.

**Wesermünde**, seaport in Hanover (Lower Saxony), Germany, on the estuary of the Weser. The artificial harbour was constructed in 1846. Woollens, wire ropes, and sails are the chief manufs. W. is an

important fishing centre, and has numerous preserving, freezing, and packing plants. Pop. 72,100.

**Wesley, Charles** (1707-88), Eng., hymn-writer, brother of John W. (*q.v.*), b. at Epworth, Lincolnshire, and educated at Westminster School and Christ Church, Oxford. He helped his brother in furthering the cause of Methodism. His greatest contributions were the hymns he wrote, numbering over one thousand, and including such well-known examples as *Jesu, Lover of My Soul* and *Love Divine, All Loves Excelling*. See also METHODISM. His *Journal* was ed. by T. Jackson (1849). See also T. Jackson, *Life and Correspondence of Charles Wesley*, 1841; life by J. Telford, 1887; and F. L. Wiseman, *Charles Wesley, Evangelist and Poet*, 1933.

**Wesley, John** (1703-91), founder of Methodism, b. at Epworth, Lincolnshire, a younger son of Samuel W., rector of Epworth and Wroth, and author of many poems. He was educated at Charterhouse, London, and Christ Church, Oxford, being elected scholar there, and took holy orders in 1725. He served his father as curate at Wroth from 1727-29, and then returned to the univ. as tutor and fellow in Lincoln College, which position he retained for six years. At Oxford, his younger brother, Charles W. (*q.v.*), had formed a small group of undergraduates who followed very strictly the ordinances of the church and were dubbed by their friends 'Methodists.' W. joined the party and became its leader. Soon after his father's death in 1735, he went to America to take charge of the Georgian mission, but in the following year retired from the charge. On his return he came under the influence of Peter Bohler, a Moravian, and became a member of that society's chapel at Fetter Lane, London. At about this time he experienced a personal conviction of salvation; it was from this time that his new movement developed. In 1739 he began open-air preaching at Bristol. In 1742 he went to Yorkshire and Newcastle-upon-Tyne, and his teaching took root everywhere. He is said to have delivered at least 40,000 sermons. He and his brother Charles, Whitefield, and others set up an independent society which met at the Old Foundry near Moorfields, London. W. made Bristol his headquarters, and he divided his followers into classes, each class being under the direction of a leader. Rules for the conduct of the classes were drawn up in 1743. He preached all over the country and was especially successful with the poorer classes, who were less in touch with the Estab. Church than the well-to-do. It was not until 1784 that W. executed the 'deed of declaration,' from which dates the beginning of modern Methodism. At W.'s death his followers numbered 100,000. He preached his last sermon at Leatherhead, Feb. 23, 1791. See also METHODISM. W. wrote many books and pamphlets, and ed. the first popular series—*The Christian Library*. W.'s *Journals* (ed. by N. Curnock, 1908-16) are the best authority for his career. The 11th ed. of his *Works* appeared in

1856-62, and his *Letters* were ed. by J. Telford (1931). See lives by R. Southey (1820), C. T. Winchester (1906), W. H. Fitchett (1906), C. E. Vulliamy (1931), B. Dobrée (1933), J. Laver (1933), Marjorie Bowen (1937), G. E. Harrison, *Son to Susanna—the Private Life of John Wesley*, 1937, 1944; M. Piette, *John Wesley in the Evolution of Protestantism*, 1937; and N. Sykes, *Wesley and the Methodist Movement*, 1950.

**Wesleyan Methodism Churches**, see METHODISM.

**Wesleyan Reform Union**. The W. R. U. arose before 1850, attracting dissentients from the ideas of Jabez Bunting (q.v.). Of all the splinter churches the W. R. U. is the only one still surviving; it declined to come into the general union of all the Methodist Churches in 1932.

**Wessel, Horst**, see under HORST WESSEL, LIED.

**Wessex** (O.E. *West saxe*, West Saxons). The chalk uplands of W. form an archaeological prov., the distinctive cultures of which can be demonstrated from the time of the Bronze Age. There was a natural geographical route for sea traffic between Normandy and Hampshire, with a western spread to Dorset, which was in use in Neolithic times. At the heart of W. and the key to its archaeology is Salisbury Plain. The historical kingdom of W. was founded by the W. Saxons or Gewissas, under Cerdic and his son, Cynric, in A.D. 519. The invaders were defeated at Mons Badonicus (520), but won a great victory at Cerdiclea (527). Cerdic died in 534, and Cynric extended his kingdom beyond Hampshire and over the Is. of Wight. His son, Coawlin (560-91), was a warlike king and made repeated inroads upon his Brit. neighbours. In 591 his own subjects rebelled against his authority at Woddesbeorg, and Coawlin abdicated and *d.* in exile. The ter. he had conquered beyond the Thames was seized by the Mercians, and W. ceased to be a powerful state. In the seventh century the W. Saxons were converted to Christianity. During the reign of Cuthred (741-54) the Mercians were defeated at Burford (752) and a code of laws drawn up. Egbert (800-36), who had spent his youth in exile at the court of Charles the Great, restored W. to its former power, and ultimately conquered the whole of England. He defeated the men of Cornwall in 815 and 835, subdued Mercia (825-29), annexed Kent, Sussex, and Essex, and before 828 was acknowledged overlord by all the peoples S. of the Tweed. W.'s ter. was increased and her power strengthened under Alfred (q.v.). His son Edward the Elder transformed the kingship of W. into that of England; W. lost its political individuality and the name became only a geographical term. See also ENGLISH HISTORY, and HARDY, THOMAS.

**West, Benjamin** (1738-1820), Amer. historical painter, *b.* at Springfield, Pennsylvania. He began portrait painting at sixteen, but in 1760 went to Italy to study, and settled in London in 1763. Here he came under the notice of George III. and soon acquired a great reputation

for his historical and religious subjects; on the death of Reynolds he was made president of the Royal Academy. See study by H. E. Jackson, 1900.

**West, Rebecca** (b. 1892), Brit. author, journalist and critic, her real name being Cicely Isabel Andrews (née Fairfield). *b.* in Kerry and educated at George Watson's Ladies' College, Edinburgh. Her writing is controversial, stimulating, and forceful, displaying a wide range of talent. Her pubs include *The Judge* (1922), *Black Lamb and Grey Falcon* (1942), and *The Meaning of Treason* (1949).

**West, Victoria, Sackville-**, see SACKVILLE-WEST.

**West Africa, British**, see GAMBIA, GOLD COAST, NIGERIA, SIERRA LEONE.

**West Africa, French**, see DAHOMEY; FRENCH CONGO; FRENCH GUINEA; IVORY COAST; SENEGAL, UPPER.

**West Africa, German**, see AFRICA, SOUTH-WEST; CAMEROON; TOGOLAND.

**West Africa, Portuguese**, see ANGOLA, PORTUGUESE GUINEA.

**West Africa, Spanish**, see FERNANDO PO, RIO DE ORO, SPANISH GUINEA.

**West African Frontier Force, The Royal, and West African Division** (81st and 82nd) The R.W.A.F.F. was formed in 1901 mainly at the instigation of Lord Lugard, though in the seventeenth century the merchants had formed various forces, composed of local tribesmen to protect their forts against raiders of all kinds. The Royal African Colonial Corps of Light Infantry was formed by Sir Charles McCarthy in 1822, and at the same time two other forces were raised: The Royal Cape Coast Militia and the Royal Cape Coast Volunteer Force. All these units were stationed in what is now the Gold Coast. In Nigeria, in 1862, a force was raised from Hausas of Nigeria as it is now known: it was first known as Glover's Hausas, the Hausa Militia and, finally, the Lagos Constabulary. It took part in the Ashanti war in 1873-74, and won the first battle honour of the Nigeria Regt. A detachment of this unit, left behind when the main body returned to Nigeria, formed the nucleus of the Gold Coast Regiment. In Nigeria there was also the Niger Coast Constabulary. It was also a fighting force of about one battalion strong and had some guns. A third force, the Royal Niger Constabulary, composed of Hausas and of Yorubas, from W. Nigeria, had a high reputation in battle and also took part in the Ashanti wars.

In 1901 a regular force of African troops financed from Brit. funds was formed and it became known as the W. African Frontier Force. By 1914 it consisted of the Gold Coast and Nigeria Regiments, and two battalions from Sierra Leone and Gambia. These troops fought in Togoland, the Cameroons, Duala, and Palestine. In June 1925 the king consented to be colonel-in-chief of the W.A.F.F. and on March 16, 1928, he conferred on it the title of 'Royal.'

In the Second World War units of the R.W.A.F.F. played a notable part in the defeat of the It. at Bullo Erillo and

in the capture of Meroë which lead to the fall of Mogadishu. In 1943, two newly formed divs went to the E. and took part in Wingate's second Chindit expedition and the fighting in the Arakan peninsula. *See also* BURMA, SECOND WORLD WAR, CAMPAIGNS IN.

**West African Indigenous Art**, *see under* NEGROES.

**West Allis**, tn. of Milwaukee co., Wisconsin, U.S.A. incorporated in 1906. It manufs. mining and other machinery, tanks, castings, radios etc. Pop. (1940), 36,400.

**West Bay City**, *see* BAY CITY.

**West Bengal**, *see under* BENGAL.

**West Brighton**, *see* HOVE.

**West Bromwich**, parl., municipal, and co. bor. of Staffordshire, England, 6 m. N.W. of Birmingham, situated on the 'edge' of the 'Black Country' dist., immediately contiguous to the boundaries of the cos. of Warwick and Worcester. It adjoins Birmingham. The name is a combination of 'broom' and 'wych', meaning the vil. of the heath of broom-land. The dist. gradually changed from a collection of hamlets on the Tame, as small ironworks appeared. The primary cause of the tn.'s subsequent rapid development was the discovery of coal nearby. Brindley's canal, completed in 1769, passed through W. B. Ancillary industries soon developed in W. B., and forges, furnaces, and foundries were erected. Then coal was discovered in the township itself and expansion became rapid. In 1819 the pop. was 9000, by 1851 it had risen to 35,000. Yet the bor. is not a completely built-up area and more than one-half of its 7000 ac. is still given over to agriculture. Heavy engineering and corollary industries are much in evidence in W. B., but the tn. is also the centre of a variety of industries and trades. Pop. 86,000.

**Westbury**, mrkt. tn. of Wiltshire, England, 5 m. S.S.E. of Trowbridge. It has a fine old church with historic associations. The main industries of W. include leather working, the making of West of England cloth, gloves, tobacco, food manuf., building, and there is a large engineering contracting firm. Pop. 5130.

**West Calder**, vil. of Midlothian, Scotland, 16 m. from Edinburgh. Shale is mined in the dist., and crude oil is the chief product, though recently this has been supplemented by many by-products such as ammonia, naphtha, and liquid soap. There are sev. coal-mines in the dist. Pop. 10,000.

**Westerham**, mrkt. tn. of Kent, England, 5 m. from Sevenoaks, and 26 m. from London. James Wolfe was b. at the Vicarage there, and lived at the house now known as Quebec House. Westerham Hill (810 ft.) is the highest ground in Kent. Pop. 3000.

**Westermarck, Edward, Alexander** (1862-1939), Finnish sociologist and philosopher, b. at Helsingfors. Educated at Svenska Normalinstitutet, Helsingfors, and the univ. of Finland, he was prof. of philosophy at the Academy of Abö, Finland, and prof. of sociology at the

univ. of London (1907-30). His works in Eng. include the *Origin of Human Marriage* (1889).

**Western Approaches**, *see under* NAVAL OPERATIONS IN SECOND WORLD WAR.

**Western Breed**, *see under* SHEEP.

**Western Desert**, administrative div. of Egypt comprising the Egyptian portion of the Libyan desert. The area was first called W. D. during the First World War, to distinguish it from the E. (Sinai) Desert. During the Second World War the term was sometimes extended to cover the desert in Libya.

**Western Australia**, state of the Commonwealth of Australia, comprising nearly one-third of the Australian continent, or all that portion W. of 129° E. long. It is bounded on the N.W. and E. by the Indian Ocean, and on the E. by N., Central, and S. Australia. The total area is 975,920 sq. m.; extreme length from N.E. to S.W. 1480 m.; extreme width from E. to W. 1000 in.

**Physical Features**.—The S. and W. coast-lands are more or less flat and sandy, with comparatively few natural harbours or other indentations, until the Kimberley div. is reached, where the character of the coast becomes bold and broken, and fringed with numerous is. The total length of the coast-line is estimated to be 4350 m. The is. are generally unimportant. The greater portion of the far interior may be described as an immense table-land, with an altitude of from one to two thousand ft. above sea-level, the surface of which consists in part of sand-dunes, varied by wide stretches of clayey soils. Long, straggling rivs., broken during the summer into a series of pools, cross the country as far inland as the hills extend, widening in many cases nearer the coast into large sea-estuaries. In the Kimberley dist. the prin. range of hills is the King Leopold Range, the highest point of which is Mt. Broome (3040 ft.). In the N.W., between the Fortescue and Ashburton Rs., the highest range is the Hamersley, with Mt. Bruce (4024 ft.) in the vicinity. The Darling Range, which extends from Yatheroo in the N. to Point D'Entrecasteaux in the S., a distance of 300 m., reaches its highest elevation, 1910 ft. above sea-level, at Mt. Cooke in the Cockburn Sound dist. In the S. the loftiest range is the Stirling Range, with Bluff Knoll (3640 ft.). Between it and the coast, and parallel with both, extends the less elevated Porongorup Range.

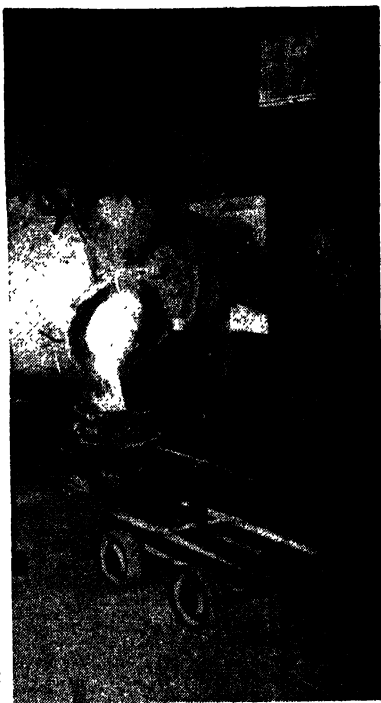
The prin. rivs. are: in the N., the Ord, with its tribs., Denham, Bow, Negri, and Panton; the Pentecost, with its trib., the Chamberlain; the Durack, Drysdale, King Edward, Prince Regent, Charley, Isdel, and the Fitzroy, with its tribs., the Margaret and Hann Rs. and Christmas Creek. In the N.W. the Do Gray, with tribs., Oakover and Shaw; the Yule, Fortescue, and Ashburton, with its tribs., the Henry and Hardy. Draining into the W. coast are the Minilya, Gascoyne, with its trib., the Lyons; the Wooramel, the Murchison, the Greenough, the Swan, on which is Perth, which, inland, is called the Aron (W. A. was

originally known as the Swan R. Settlement); the Murray, the Collie, and the Preston; and, on the S. coast, the Blackwood, Donnelly, Warren, Deep, Frankland, Denmark, Hay, Kalgar, Pallenup, Gairdner, Fitzgerald, and Phillips Rs. There are no lakes of any considerable importance. Between the Darling Range and the coast are a few salt-water lagoons, and many freshwater lakes, mostly nothing more than swamps during the dry season, and none of any economic importance. The so-called lakes of the interior, which are frequently of very considerable area, are, except after the occasional heavy rains, merely immense salt marshes. W. A., though not possessed of majestic mt. heights, has a share of natural beauty as rich and varied as may be found, exhibited in, to name two features out of sev., the ruggedness of its hills and the grandeur of its forests. On the Warren R., in the S.W. it is not unusual to find Karri trees which attain 300 ft. in height. The most remarkable special feature is found in the many beautiful limestone caves, those of the Margaret R. being of exceptional grandeur and picturesqueness. The climate is most temperate, especially in the S.W. where excessive cold is never, and excessive heat very rarely, known.

**Land Settlement.**—Some two-thirds of the area of the State is suitable for pastoral purposes, immense tracts having been proved eminently so. The portion of the State more immediately fitted for agric. purposes and closer settlement is the S.W. div. It has large areas specially suitable for mixed farming, dairying, potato and fruit growing, and large portions are covered with forests of considerable commercial value.

**Production and Industries.**—It is now some time since the immense capabilities of the State as one of the world's great wheat producers were generally realised. During the period 1920-1939 marked progress was made in the production of wheat and also wool. Until about 1900 the State did not produce enough wheat for its own requirements, but for some years past the export of wheat has been one of the States chief assets. In 1919, the production of wheat totalled 11,222,950 bushels, and by 1924 this had been more than doubled. Between the latter year and 1930 the production increased from 23,887,397 bushels to 53,504,149 bushels. In 1948-49, 36,250,000 bushels were produced from over 2,867,577 ac. Other crops include oats (6,993,295 bushels), barley (981,426 bushels), hay (277,329 tons), and potatoes (40,000 tons). From 1924 to 1929 the production of wool increased from 43 to 67 million lb. The wool clip in 1948 was 93 million lb. Fruit production has increased considerably in recent years and has created a large export trade to foreign markets. In 1948-49, 1,667,426 bushels of apples were produced, and 4700 tons of currants and raisins. Over 5300 cwt. of tobacco was grown. A very extensive portion of the S.W. of the State, containing many millions of ac., is especially suitable for

wheat-growing, whilst the hills of Darling Range and many other portions of the State produce apples, oranges, grapes, and other excellent fruit in the, greatest variety. Along the S.W. coastal plain irrigation has been developed in three main areas totalling 72,000 ac. Stock raising and dairying are the chief beneficiaries.



Government of Western Australia

KALGOORLIE: POURING GOLD  
AT CHAFFER'S MINE

For a long period lead and copper mines were worked in the vicinity of Champion Bay, but activity gradually declined until the 1939-45 War—lately there has been renewed interest in the field. Copper is found, however, in other dists., notably those of Mt. Morgan, Phillips R and W. Pilbarra. The other mineral resources of W. A. were almost unknown and quite undeveloped until about 1900. Gold was found in considerable quantities in the Kimberley goldfields in 1887 and this, attracting experienced miners led to the discovery of great quantities at Coolgardie and Kalgoorlie in 1892-93. After the opening up of the goldfields of W. A., gold mining became for a time the prin. industry of the State, and indeed the State produces as much as 79 per cent of the

total gold output of Australia. The aggregate output to the end of 1949 was valued at £205,632,035. The output in 1949 was 648,426 fine oz., valued at £7,962,808. Good coal is found at Collie in the S.W., and there is evidence of its existence in the Champion Bay and Irwin R. dists.; output in 1948 was 732,938 tons. Large deposits of stream tin were discovered in 1888 at Greenbushes, on the Blackwood R., and much tin has also been raised at Marble Bar. Other prin. minerals are arsenic, silver, asbestos, and pyritic ore. In 1947 the value of the total mineral output was £8,862,277. Over half a million gallons of wine are made annually. Timber is also an important product, W. A. Jarrah being known throughout the world for its durability. The value of timber exports is over £1,000,000 annually. There are pearling banks at Broome and on the N.W. coast generally. The more important exports of local products for the year 1948-49 with Australian currency values were wheat (£14,050,000) flour (£5,300,000), wool (£21,500,000), timber (£1,099,000), hides and skins (£1,067,000), meat (£1,032,800), fresh fruit (£726,000), and butter (£523,000).

**Education.**—Free education is available. Primary education is compulsory. Technical schools are estab. in the prin. centres. The univ. of W. A. in Perth (also free), provides courses for degrees in arts, science (including agriculture), engineering, etc.

**Communications and Population.**—There are 4318 m. of main railroads, owned and worked by the W. A. Gov. There are also 277 m. owned by the Midland Railway of W. A., and 450 m. of Commonwealth line. There are two Commonwealth Gov. interstate airlines from Perth to other State caps., and two main companies maintain air communication within W. A. There is a high-power Commonwealth Gov. wireless station at Applecross, between Perth and Fremantle. There are also lower-power stations at Esperance, Geraldton, Broome, and Wyndham. The chief port is Fremantle, which is the first and last port of call in Australia for all mail and other liners using the Suez route, and for many on the Cape route. The chief tn. is Perth, which had a census pop. in 1947, within the 10 m. radius area of the metropolitan dist., of 272,586, which total includes the Fremantle suburbs, the pop. of which was 27,926. The ports, besides Fremantle, are Albany (4000), Bunbury (6000), Geraldton (5900), and Broome (1000).

The chief centre of the agric. dists. is Northam (4700), of the goldfields areas, Kalgoorlie (12,000), Boulder (7000), and of the coal-mines, Collie (4500).

**Constitution and Government.**—Responsible gov. was granted to W. A. in 1890. The legislature consists of two Houses. The Legislative Council, with thirty members, and the Legislative Assembly, with fifty members. Both Houses are elective. Women are not disqualified by reason of sex either for election or as voters.

**Early History.**—Probably the earliest

exploration was that which is recorded in the words cut into the tin plate now in the State Museum at Amsterdam, which was nailed on Oct. 25, 1616, by Dirk Hartog, the commander of the Dutch vessel, *Kendraght*, to a post erected on the Point Inscription on what is now Dirk Hartog Is. The first Englishman to land on these coasts was Wm. Dampier, who, in 1688, in the *Cygnet*, landed at King Sound. Fr. navigators followed during the next century notably D'Entrecasteaux in *La Recherche* in 1792, de Freycinet in 1818, and de Bougainville in 1825. In 1791 Vancouver, in the *Discovery*, took formal possession of the country above King George Sound; in 1801 Matthew Flinders in the *Investigator* explored the S. coast which, at his suggestion, subsequently received the name of Australia; whilst between 1813 and 1822 Philip Parker King charted the N. coasts. In 1826 the gov. of New S. Wales sent some convicts and a detachment of soldiers to King George Sound and formed a settlement then called Fredericks Town. In 1827 Captain James (later Sir James) Stirling surveyed the coast from the Sound to Swan R. and in 1829 Captain (later Sir Charles) Fremantle in H.M.S. *Challenger* took possession of the ter., and founded the Swan R. Settlement, which is now the State of W. A., and the tns. of Perth and Fremantle. Capt. Stirling was the first lieutenant-governor.

**Aborigines.**—The aboriginal pop. was estimated in 1917 to be 20,000 (excluding half-castes), some 15,000 of whom are in touch with civilisation, and the remainder in those parts of the State as yet uninhabited by the white man. The aborigines are still assisting to no small extent in the development of the N. portion of the State, chiefly as stock boys, shepherds, station hands, domestic servants, etc. Generally speaking, the aborigines are not hostile, though at times they are troublesome owing to their proneness to cattle-killing. The policy of the Aborigines Dept. is in the direction of inducing the natives to support themselves by their own labours, and this policy is worked through a number of native stations and settlements set up in the N. and S.

See H. Taunton, *Australia*, 1903; Sir H. P. Colebatch, *A Story of One Hundred Years*; J. S. Butt, *Western Australia: A History from its Discovery to the Inauguration of the Commonwealth*, 1924; *Western Australia, 1829-1929*, 1929; Sir J. W. Kerwan, *An Empty Land, Pioneering in Australia*, 1934; P. Hasluck, *Black Australians: A Survey of Native Policy in Western Australia, 1829-97*, 1913; and *Pocket Year Book of Western Australia* (ann.).

**Western Front in Second World War.** For events leading up to the outbreak of war in 1939 and the opening up of a W. F., see EUROPE (History) and WORLD WAR, SECOND.

A. CAMPAIGNS OF 1939-40.

**September 1939-April, 1940.**—There was no serious fighting on the W. F. before May 1940. When the Second

World War started, the urgent problem of the W. Allies was to render effective aid to Poland. Direct aid was possible only by attempting the hazardous task of forcing a military expedition through the Baltic. Indirect aid could only be really effective if adequate forces were deployed on the W. F. to compel the Gers. to divert a substantial part of their E. armies to the defence of the Rhineland. With a half-hearted France relying passively on the Maginot Line (q.v.) and a few Brit. divisions with no armour, a frontal assault on the W. Wall (q.v.) or Siegfried Line was out of the question. At the start of the war, however, the Fr. armies under Gen. Gamelin advanced with cautious deliberation against the Siegfried Line; by Sept. 5 they were along the frontier between the Rhine and Moselle and finally they occupied an area of about 250 sq. m. within the Ger. frontier. The chief activity was around Saarbrücken, but the operations were not marked either by enthusiasm or resolution. There was strong Ger. resistance by 12 Sept. and counterattacks began three days later, when the Gers. were free to switch all their forces from Poland to the W. By the end of Oct. the Fr. armies had fallen back on their own frontier and operations were reduced to a few raids and artillery duels, with patrol activity. During this time Brit. troops were crossing the Channel and by Oct. 11 about 150,000 men had reached France. Early in Dec. Brit. troops were in occupation of a portion of the Maginot Line in contact with the Gers., who, however, far from contemplating any direct assault, were making strenuous preparations to deliver a flank attack through the Low Countries. There was no intensive activity in the air in this early period of war on the W. F. There was no bombing of back areas or communications. Troop movements on both sides took place without interference from the air. There were only reconnaissance flights and 'leaflet raids' by the R.A.F. over Germany.

*Invasion of the Low Countries, 1940.*—At 3 a.m. on May 10 Ger. land and air forces launched an attack on the Netherlands, Belgium, and Luxembourg, and simultaneously carried out extensive bombing raids at many places in the Low Countries and also on a number of tns. in France. In the meanwhile, fierce resistance was offered by Dutch and Belgian troops and immediate appeals for help were made to Britain and France. General mobilisation was ordered in Belgium at 4.30 a.m. and King Leopold assumed supreme command of the Belgian army. In Luxembourg, a large part of which was immediately overrun by the enemy, the Grand Duchess and the gov. left the country and reached N. France, taking with them the official archives and the national gold reserve.

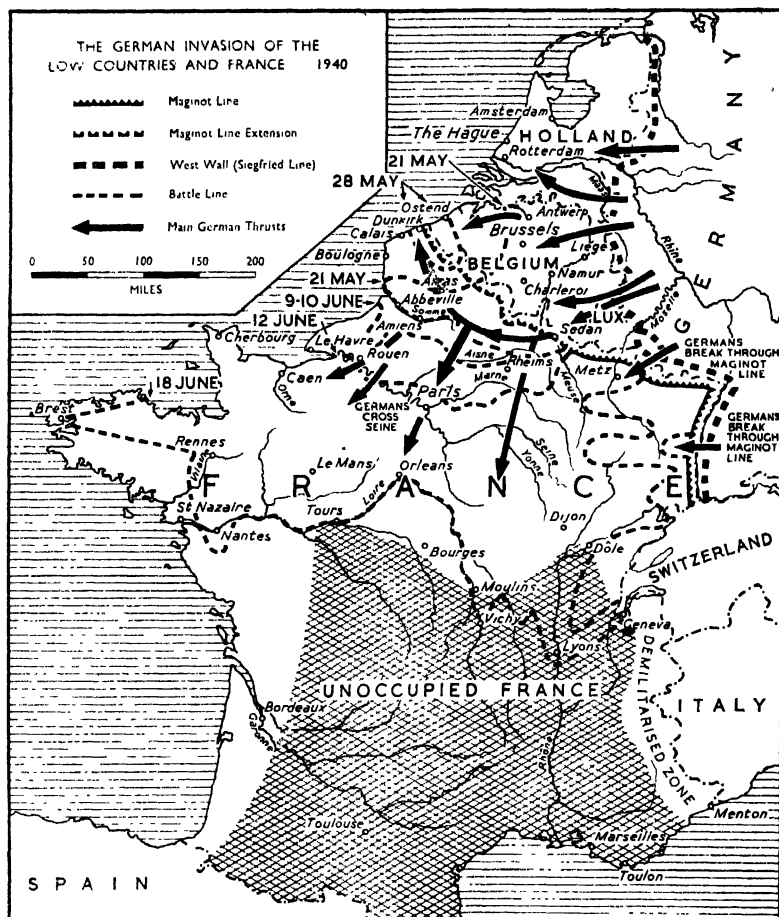
The Ger. assault was accompanied by heavy air attacks on the main aerodromes in Holland and Belgium and the movement of masses of mechanised troops across the frontiers. The Dutch resisted desperately throughout the day (May 10),

while thousands of Ger. parachute troops landed in many parts of the country in an effort to seize important strategic points such as aerodromes, bridges, and even barracks. The desperate resistance of Dutch forces, however, frustrated the Ger. objective which was to seize Rotterdam and the Hague and to capture the Queen and the gov.

The Belgian army put up a fierce resistance and, having destroyed the roads, prevented the enemy from making any progress on that day, though Brussels, Antwerp, and other cities were indiscriminately bombed. In the early morning British and French mechanised forces, which in response to the Belgian appeal had crossed the frontier, proceeded swiftly towards the E. and N. frontiers, while Allied planes and Brit. naval units co-operated with Dutch planes and ships.

In France the Gers. attacked with very large air forces during the night and many Fr. aerodromes were bombed. Attacks were carried out on the civilian pop. in the Low Countries and in France. It was soon quite evident that Holland would not be able to prolong her resistance. Parachutists continued to be dropped on Dutch soil in great numbers; soldiers landed from barges which had been lurking in Dutch rivers, for days, while Nazi sympathisers in the Dutch tns. co-operated in operations by sabotage and other forms of treachery. Moreover, bombing continued on the crowded cities, which were almost totally unprepared for air raids. In the land operations the Ger. capture of Maastricht (May 11) was the beginning of the end in that quarter of the W. F. In Belgium, however, the Belgian army continued to hold the 'demolition line', considerably in advance of the first defence line, and there was heavy fighting on the Albert Canal, on the Meuse, and in the Ardennes.

*British and French Advance through Belgium.*—On the succeeding day, fighting on the whole W. F. from Holland to N. France was very fierce, the Brit. and Fr. march through Belgium continuing with great speed. Intense Ger. air activity, however, continued on a large scale over the Low Countries and N. France, hundreds of planes being in action. Despite the flooding of low land by the Dutch, the enemy crossed the Meuse in the prov. of Limburg and penetrated into Belgium, thrusting across the Albert Canal towards Hasselt. The success of this decisive manoeuvre was due to an overwhelming air superiority. More air raids were carried out on Belgian tns. and long columns of refugees, mainly women and children, leaving the war zone were bombed and machine-gunned on the roads by Ger. planes. The activities of spies or 'fifth columnists' (see FIFTH COLUMN), the masses of tanks the thrust of heavily armed motor cyclists racing far ahead of the tanks into the Belgian and Dutch cities, the merciless bombing of open cities and tns., and the hampering of the movements of the troops by masses of terrified and panic-stricken civilians, inevitably spoiled ultimate disaster. But



it is conceivable that if certain bridges over the Meuse had been destroyed the German advance might have been halted and perhaps eventually the lines might have become stabilised as in the First World War. But this is conjectural and it was evidently wrong for military leaders to think in terms of trench or static warfare in face of the Ger. development of heavy tanks, dive-bombing, and the calculated effects of air action on open cities, apart altogether from the highly organised 'fifth column operations'. On May 13 the Ger. forces in Holland broke through the first line of defence on the IJssel and made a bold thrust along the Maas and the Waal, with the obvious intention of driving a wedge between Belgium and Holland. Here again an

important factor in the Ger. success was the omission to blow up a bridge near Arnhem, an omission due to fifth column activities, as indeed it was in most of the notorious cases on the W. F. where bridges were left intact: over these the Ger. tanks, armoured cars, and cyclists passed at will. On this day, May 13, the Gers. employed about 1000 heavy tanks in Belgium, the centre of their attack being the Ardennes area, where immense armoured forces and bombing planes made a combined effort to force the way through to the Meuse and towards Longwy and Montmédy. On the succeeding day (May 14) the Gers. had reached the Meuse from Liège to Sedan and the battle raged from the Moselle to Longwy. *Allied Evacuation of Sedan.*—Sedan was



evacuated in the evening of May 14. The Gers., by the power of their mechanised forces, broke through the vitally important Belgian defences at the angle of the Meuse and the Albert Canal, their object being to overwhelm Belgian resistance before liaison could be estab. with the Fr. and Brit. Forces. Meanwhile the R.A.F. continued incessant day and night attacks on Ger. strategic points and columns, often against vastly superior numbers. In Holland on the 13th the position for the Dutch had suddenly become desperate owing to the Gers. crossing the Moerdijk bridge which brought their forces in rear of the flood defences and linked up with their troops at Rotterdam. This city was the scene of ceaseless air attacks.

On May 15, the Brit. Expeditionary Force in Belgium was heavily attacked on its entire front, fighting being especially severe around Louvain, out of which sector the Brit. troops succeeded in driving the Gers. in a series of brilliant counterattacks. Farther S. the enemy, drove a salient into the Fr. lines, though their advance was hampered by air attack from the Fr. and Brit. aircraft. In Holland the Dutch continued to hold out in the is. of Zeeland but the Gers. now entered the remainder of Rotterdam, Amsterdam, and The Hague and, indeed, were in full possession of the country. The Dutch army was ordered to lay down its arms. Fighting in Belgium continued with unabated violence, the Belgian army retreating in good order in the N. and central parts of the country. On the Meuse the battle also continued, and, in the S., the Fr. withdrew to their main defensive positions (a continuation of the Maginot Line), leaving Sedan uncovered. At Liège the forts were still holding out, though isolated; and the enemy penetrated beyond the city. On May 14 von Rundstedt's armoured columns crossed the Meuse between Sedan and Namur, breaking the hinge of the Allied advance into Belgium. The tanks drove on westward whilst behind them the gap " " widened. The Brit. and Fr. forces were thus compelled to retreat, and abandon Brussels and Antwerp: the movement began on the night of the 16/17th. On May 17, the Gers. entered Brussels, Louvain, and Malines, the Allies establishing themselves E. of the cap. in good defensive positions. The Belgian Gov. moved to Ostend. For a time there was hope in the Fr. counterattack in the Sedan area where massed Ger. tanks were pounded by a great number of Fr 75-mm. guns and by fierce resistance around Réthel. Indeed, though the bulge in the Fr. defences had been widened between the Sambre and Sedan by Ger. tanks and dive-bombers, there was a slackening in the Ger. attack on May 18. The Gers. entered Antwerp on this day but the Brit.-Belgian line remained intact and repulsed all attacks. On the next day (May 19), Gen. Weygand succeeded Gen. Gamelin as commander-in-chief of the Allied forces. At the same time some fifteen Fr. generals were relieved of their commands. By these

changes it was hoped to retrieve the desperate situation, but the will to fight of the troops was more important, and this seemed to be disappearing. (See FRANCE.)

*German Advance on the Channel Ports.*—On May 19 the main Ger. drive from the Meuse, having pierced the Fr. line between Valenciennes and Sedan, turned westward towards the Channel ports, both Le Cateau and St. Quentin falling into their hands after stubborn resistance. On May 20 the drive was vigorously continued and on that day Laon fell and the Gers. advanced S. to the historic Chemin-des-Dames. They then reached Abbeville (which suffered damage during the fighting); Arras, and Arras on the following day; but in Belgium the Brit. and Fr. forces still held the line of the Scheldt and threw back the enemy both there and S. of the Scarpe. The situation was still more ominous on the morrow when the Ger. motorised forces advanced further towards the Channel N. of the Somme in the direction of St. Pol and Montreuil-sur-Mer. But there were fierce counterattacks between Arras and Douai by the Brit. troops and heavy fighting between Cambrai and Valenciennes. The Gers. now held an immense bridgehead over the Somme, and the B.E.F., the Fr. First Army and other units, and the Belgians were cut off, though their S. flank was reasonably solid along the canals between Escourt and La Bassée, and to St. Omer along the R. Aa. The main communications were cut and only N. Channel ports available. The B.E.F. and the Fr. First Army began to withdraw to the R. Lys, and whilst this movement was in progress another calamity befell them. On May 28 King Leopold of the Belgians capitulated to the enemy.

*Evacuation of B.E.F. at Dunkirk.*—As late as May 27 the Brit. front remained intact, and at Aire, on the Lys, the B.E.F. counterattacked successfully with the co-operation of Fr. tanks. But the surrender of Belgium created a situation of extreme gravity for the isolated Brit. and Fr. forces in Flanders, now surrounded on all sides by the enemy's armoured forces and subjected to continual intense air bombardment, with only one small corridor to the sea at Dunkirk remaining. At Boulogne the R.N. evacuated a brigade of Guards on May 23-24 after sailors had gone ashore and destroyed facilities likely to be of use to the enemy. A few days earlier a brigade drawn from the Rifle Brigade, the 60th Rifles, the Queen Victoria Rifles, and the Royal Tank Regt., was sent from England to hold Calais, with an equal number of Fr. troops, and to maintain communications with the B.E.F. Finding it impossible in face of strong enemy mechanised forces to carry out the latter task, it concentrated on the defence of Calais and, in spite of repeated attacks of two armoured divs. and continuous air and artillery bombardment held out until 27 May, losing most of its personnel (only 30 survivors of a total force of 4000 were brought off by the Navy), but by its epic

heroism it gave the greatest assistance to the main body of the B.E.F. in its withdrawal on Dunkirk (q.v.). Time gained enabled the Gravelines waterlines to be flooded and to be held by the Fr. troops. Thus it was that the port of Dunkirk was kept open. The Ger. High Command now declared that 'the fate of the Fr. armies in Artois was sealed' and that 'the Brit. army was threatened with annihilation.' This was true. But the B.E.F., were resisting heroically and were inflicting enormous losses on the enemy. Meanwhile Gen. Prioux's Fr. forces were desperately striving to cut their way through at Cassel, 20 m. S. of Dunkirk and at Kemmel, to the S.W. of Ypres, and there was more desperate fighting on the banks of the Yser. On May 29, the Brit. were occupying a narrow tongue of land extending from a point W. of Dunkirk, through Bailleul to Armentières and thence back towards Ypres and Dixmude. But their operations were impeded by the thousands of refugees caught between the fire of the opposing forces and heavy pressure from opposite quarters compelled the Brit. still further to shorten their line. The following day the Brit. and Fr. forces in the N. continued to fall back on the coast in face of some forty Ger. divs. With the Allied forces in desperate straits and packed into a small bridgehead, the Ger. armoured forces were forbidden to attack. This order, which was received with astonishment by the local commanders, emanated directly from Hitler and has never been satisfactorily explained. It made the task of evacuation at least possible, but the troops still had to endure artillery bombardment and air attack upon the beaches and the rescuing craft. The tenacity of the men of the B.E.F. and the firmness of the rearwards never wavered, and over the next few days was enacted one of the greatest feats of rescue in the hist. of war. The Brit. Gov. itself did not expect any successful outcome of the attempt. For the troops, Brit., Fr., and Belgian, were being embarked in full view of the enemy, and from the open beaches, with the men often wading up to their necks to reach the boats. But c. 337,000 men (War Office records, 336,427; Admiralty, 338,226) were taken off and reached England by June 4 by a relay fleet of small ships. The work of the R.A.F. and the Fr. Navy at this time was outstanding. Elements of Prioux's army fought their way to the coast. This was palliated one of the greatest military disasters in Brit. hist., in which the Brit. army had lost all its guns and transport, and all the armoured vehicles that were with the army in the N. Not all the Brit. troops were evacuated from Dunkirk; large numbers moved across France to Normandy and Brittany to be evacuated from there. At this date the Fr. army had been gravely weakened, the Belgian army had been lost, a large part of the fortified lines upon which so much faith had been reposed was gone, many valuable dists. and factories had passed into the possession of the Gers., the whole of

the Channel ports were now in their hands and a mortal blow, either at Britain or at France, was to be expected at any moment. Well might Mr. Churchill tell the Commons that, while a miracle of deliverance had been achieved at Dunkirk, they must not assign to that deliverance the attributes of a victory, and that wars were not won by evacuations; but he emphasised the victory inside the deliverance, the triumph of the R.A.F.

*The Battle of France.*—The Fr. armies, demoralised, now faced their enemy alone. The fighting around Dunkirk gave some respite to the Fr. in the S. and Weygand created a defensive system in depth, though of an elementary nature, on the Aisne and the Somme, where, however, the Ger. bridgehead already existed. Early on June 5 the Gers. delivered a new offensive along the whole of this improvised Fr. front from the Channel to the Laon-Soissons road, the attack being violently pressed against the left wing of the Fr. on the Somme and, the following day, this so-called battle of France, was waged with unabated violence between the sea and the Chomin-des-Dames, the Gers. throwing in masses of tanks in groups of 200 or more at numerous points. On June 7 Gers. were making a particularly heavy thrust on the lower Somme near Abbeville, S. of Amiens in the Oise valley, and in the direction of Rheims. The next day they launched a violent attack between Aunale, near the source of the R. Bresle, and Noyon, 27 m. S. of Péronne. In face of seven armoured divs. and twenty fresh infantry divs., the Fr. line withdrew between the Somme and the Channel. On the same day a group of Ger. tanks penetrated to the Dicppe-Paris road at Forges-les-Eaux, 40 m. S.W. of Abbeville.

On the sixth day of this great battle Italy declared war on Britain and France. Already the enemy was almost at the gates of Paris, and on June 10 M. Reynaud appealed to President Roosevelt for material aid and said that France would continue to fight, if necessary from N. Africa. But he reckoned without the disintegrating forces within France itself. On June 9, Ger. armoured units in the region of Forges-les-Eaux and Argueil, on the left of the Fr. line, were advancing towards Rouen and Gisors; but between Montdidier and Noyon, at Soissons and in the Champagne, their advance seemed temporarily checked. The next day some Ger. units had crossed the Lower Seine, while furious fighting was in progress E. of the Aisne as far as the Argonne. At Réthel, N.E. of Rheims, (June 11, they suffered very heavy casualties, but farther W. their advance guards had penetrated to within 20 m. N.E. of Meaux, while a thrust N.W. of Paris towards Pontoise brought the enemy within striking distance of the Fr. cap. The Fr. Gov. depts. now left Paris for Tours and the Ger. approach led also to a vast exodus of civilians. The enemy, now in Rouen, was increasing his attacks from that city to Vernon in order to extend the bridgeheads estab. S. of the Oise; while near Château Thierry he

was already securing a foothold S. of the Marne. The estab. of these bridgeheads over the Seine and Marne now disclosed the menace of the huge pincer movement on Paris which was closing in on the city from N.E. and N.W.; while W. of the city the Gers. were attacking with fresh forces S. of Rouen and towards Evreux; Ger. advanced units were moving on Le Havre by June 13. On that day, the bulk of the 51st Highland Div., which had been in action in Normandy, was surrounded by superior forces and obliged to surrender; attempts at evacuation being only partially successful owing to fog.

The 1st Canadian Div. and the 52nd Lowland Div., sent from England early in June, were withdrawn by the 17th, only the 157th Brigade of the 52nd having gone into action. The embarkation of other Brit. troops proceeded: in all, 136,000 Brit. and 20,000 Poles were evacuated from Fr. ports. On June 14 the enemy entered Paris. Meanwhile, the battle of France continued along the whole front. Le Havre fell; Verdun was stormed; and Montmédy, the corner-stone of the Maginot Line, was taken. The entire Fr. line was crumbling. The Fr. armies S. of Paris were still retreating, and in Alsace-Lorraine the Gers. broke through the Maginot Line at Saarbrücken. The French Gov. then left Tours for Bordeaux (June 15), whence M. Reynaud made a last desperate but vain appeal to President Roosevelt. Thereupon the Fr. Gov. resigned and was replaced by a new gov. under Marshal Pétain, whose function was simply to ask Hitler for an armistice, leaving Britain alone to defend the world cause. In an eleventh-hour hope of restoring Fr. morale, the Brit. Gov. offered to conclude a solemn Act of Union between the two countries, involving a single war cabinet and common citizenship. The proposal was rejected.

*Franco-German Armistice.*—However, at that date, it was not known what would happen in France or whether, in spite of Pétain's appeal for an armistice, resistance would be prolonged. Fighting was still in progress on the Loire, in Upper Alsace, and at Sarrebourg and in other parts of the W. F., but the Gers. claimed, justifiably, that the Fr. armies were 'at the point of dissolution.' The Fr. command admitted on June 18 that the enemy had penetrated deeply into Normandy and Brittany and that advanced units had reached Cherbourg and Rennes. On the Loire the Gers. had estab. bridgeheads between Orléans and Nevers and had crossed the Oise near Caen and Le Mans and captured the armament centre of Le Creusot and the fortress of Belfort. Meanwhile Gen. de Gaulle, *chef du cabinet militaire* under M. Reynaud, who was now in London, withstood the attitude of the Pétain Gov. From London he made an appeal to all Fr. officers, soldiers, engineers, and skilled workers in Britain to get into touch with him.

His difficulties, however, were very great, for Fr. morale had so deteriorated that most of the nation blindly followed the lead of Marshal Pétain. By June 18-19

the Gers. were pushing forward towards Nantes and Lyons, besides having captured Strasbourg, Lunéville, Toul, and Nancy. This marked the end of organised fighting and on June 20 Pétain broadcast a message telling the world that he had asked the enemy to put an end to hostilities. On June 21 the enemy took the naval base at Brest and had reached the Lower Loire between Nantes and Tours. Bordeaux was heavily bombed, the Fr. Gov. then, rather otiosely, declaring the city open. Hitler handed the armistice terms to the Fr. plenipotentiaries in the forest of Compiègne on June 21 and, pending communication with the Bordeaux Gov., hostilities continued on the Western Front, chiefly in the region of Thionville and Colmar—where it was very bitter—and in the Vosges, where the Fr. troops carried on the fight, sev. times repulsed the enemy and counterattacked. On the next day there were only local engagements S. of the Loire, while in the N. the Gers. took St. Malo and Lorient in Brittany. At this moment it. troops were attacking the Fr. at various points between Mt. Blanc and the Mediterranean with little success. But this desultory fighting marked the close of hostilities on the Western Front, for on the same day the Fr. Gov. accepted the Ger. terms. Mr. Churchill immediately took speedy action to prevent Hitler from capturing the Fr. navy and so saved Britain (*see under NAVAL OPERATIONS*). On the same day Gen. de Gaulle announced the formation of a Fr. National Committee in London which would carry on the war at the side of the Brit. Army until final victory.

## B. CAMPAIGNS OF 1944-45.

*I. INVASION OF NORMANDY.*—*Plans and Preparations.*—Informal discussions for the cross-Channel invasion of Ger.-occupied Europe began as early as 1942, and at the Casablanca conference of Jan. 1943 it was decided to evolve outline tactical plans. Such a plan to be known as 'Operation Overlord' was approved at the Quebec conference in August. At the beginning of 1944 Gen. Eisenhower, appointed supreme commander of the Allied Expeditionary Force, left the Mediterranean for England. Both he and Gen. Montgomery, who was to command the land forces, agreed that the initial assaulting force should be increased to five divs. from the three originally planned. Two follow-up divs. and three airborne divs. were used also. The initial objectives were to be Caen, Bayeux, Isigny, and Carentan, and the port of Cherbourg, then the Breton ports southwards to Nantes; after this was to come a drive eastward on the line of the Loire towards Paris and N. across the Seine area with the object of destroying as many enemy forces in this area as possible.

A very great deal would depend on the enemy's rate of concentration. Efforts to delay this included air attacks on his troops and communications, the threat of

other landings, particularly in the Pas de Calais, and the aid of the Fr. Forces of the Interior. All these measures proved highly effective. Moreover, overwhelming air supremacy was obtained.

On the Ger. side F.-M. von Rundstedt was Commander-in-Chief West, and F.-M. Rommel commanded the N. and larger army group. By June von Rundstedt had 60 divs. in France, Belgium and Holland, 10 being armoured or motorised. In the immediate area of the Allied landing there were 9 infantry and 1 panzer divs. Rom-

successfully effected on the five sectors as planned: the Amers. of Gen. Bradley's First Army on the two westerly, and the Brit. of Gen. Dempsey's Second Army with the Canadian First Army on the three easterly beaches, all under Gen. Montgomery. By June 11 a beach-head 50 m. wide and 10 to 15 m. deep had been gained, so that further landings of troops with every kind of necessary equipment could be carried out on a large scale. For the greatest amphibious operation in world hist., the combined losses of the



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**'D'-DAY: MEN OF THE 13/18TH HUSSARS ASSEMBLING ON 'WHITE' BEACH**

Medical personnel are attending to casualties, landing craft are seen in the background.

mel had been urging on the strengthening of the coastal defences; he said that if a defensive success were to be obtained it would require the breaking-up of the invasion on the beaches.

**Allied Landings in Normandy.**—The invasion began at 2 a.m. on June 6 (known as 'D-Day'), with mass airborne para-troop landings behind the Ger. lines; two Amer. divs. then landed at the base of the Cotentin Peninsula, and two Brit. and one Canadian further E. to hold the left flank on the R. Orne. An immense force of 4000 ships, with sev. thousand smaller craft, crossed the Eng. Channel with the land forces and their equipment. More than 640 naval guns from 16-in. to 4-in. bombarded the beaches and enemy strongpoints in support of the invading armies. The landings were, after heavy fighting and some anxious moments,

Brit. and Amer. fleets were remarkably small. On June 8 Bayeux fell to the allies in fierce armoured and infantry battles. Contact was now estab. between the seaborne and airborne troops. Tanks were landed both by ship and by big transport gliders, and a tank battle was soon in progress near Caen. Beach landings continued on the ensuing days. On June 8, 1,000 Flying Fortresses and Liberators attacked bridges and railway junctions and airfields within an arc 100 to 150 m. around the beachhead, while medium and light bombers kept up the assault on railway targets nearer the troops. The Allies now thrust forward from Bayeux S.W. towards St. Lô, while von Rundstedt counter-attacked in the Caen area. Gen. Montgomery advanced in the Caen area so as to engage in a bitter tense holding struggle while Amer.

troops under Gen. Bradley crossed the Carentan-Valognes road and cut the railway to Cherbourg. Montgomery's tactics were to lead von Rundstedt to believe that his main attack would be directed towards Paris, while, at the same time, by holding the enemy at Caen, he enabled the Amers. to advance up and across the Cotentin or Cherbourg Peninsula. Thus at this early stage in the battle of Normandy the Gers. were forced to make a complete change of front from a line parallel to the coast to one running straight across from sea to sea. At the same time this involved a lengthening of their front.

*Capture of Cherbourg.*—On 11 June the Amer. reached the outskirts of the tn. of Montebourg 16 m. S. of Cherbourg. On the 12th, Amer. troops by-passed Montebourg and passed on to Valognes and Cherbourg. Two days later W. of Caen Brit. forces fought their way to Caumont and Villers-Bocage. On the 16th the threat to Cherbourg grew with the capture of St. Sauveur. By reaching the W. coast on June 17, the Amers. isolated the Ger. troops to the N. as well as Cherbourg. Strong gun emplacements guarded the approaches to the naval base, which made it a hazardous operation to attempt to use capital ships against it. On June 22 an all-out attack was launched by the Amers. after an intense artillery and air bombardment. Inside the port the Gers., driven back on the defences in disorder, were destroying harbour installations. To the E. the Brit. and Canadian forces, by pinning down four panzer divisions, made it impossible for the enemy to undertake any effective counter-attack in relief of forces in the Peninsula. The joint Ger. commanders gave themselves up on June 26, and the Arsenal resisted until the next day, and fanatical groups had further to be eliminated. All resistance in this N. sector ended on July 1.

*The Battle for Caen -- Capture of La Haye du Puits.*—With Cherbourg in the hands of the Allies the centre of gravity shifted to S.W. of Caen, where Montgomery's forces were pressing on against bitter resistance. Here the Gers. had not yet made a major counter-attack but were bringing up first-class reinforcements probably from the E. front. Previously, on June 25, Montgomery's forces had begun an attack E. of Tilly-sur-Seuilles. Brit. forces crossed the Odon on the 28. The battle for Caen was now joined. The Brit. held firm on the Odon salient against repeated counterattacks and it was obvious that hard fighting remained before the enemy hold on Caen, with its network of communications, could be broken. At the beginning of July the initiative was indubitably with Gen. Montgomery. Except for a little ter. W. of Villers-Bocage and near Troarn, his forces held all their gains since the landings, besides establishing a broadening salient directed at Caen from the S.W. To have reached this position in three weeks from the initial landings was an astonishing achievement. On

July 3, the Amers. started an offensive in the direction of La Haye du Puits, the opening attack being delivered in driving rain on a 20-m. front. In the Second Army area the Canadians battled towards Caen from the W. and there was a three-day struggle for the Carpiquet airfield (July 4-6). On July 8 Montgomery launched a massive attack upon Caen preceded by a heavy aerial bombardment. The Gers., with their supplies out off, broke, and the tn. N. and W. of the Orne was occupied.

*The Battle of the Rivers (Odon and Orne).*—*Americans take St. Lô.*—Though Caen was in Brit. hands, the enemy remained firmly in possession of the Faubourg de Vaucelles across the riv. Moreover the difficult Bocage country and high ground overlooking the vils. of the Odon and Orne would only yield to a kind of crowbar process of attrition. The Second Army, however, exploited its victory at Caen, for on the morning of July 10 fresh infantry and armour struck through the bridgehead estab. over the Odon by the 15th Scottish Div. and headed S.E. for the Orne. The impetus of the Brit. movement across the Odon carried them to high ground above Malfot and Esquay in the direction of the Orne. The Ger. reaction was vigorous, and once more he was forced to use the armoured units which he had been trying to withdraw to form a strong striking force. On the night of July 15 the Brit. Second Army made a double thrust between the rivs. towards Noyers astride the main road to Villers-Bocage and against the tn. of Evrecy. Meanwhile the Gers. were fighting fanatically to retain the heights surrounding St. Lô, but the Amers. were gradually closing in round the tn. By July 16 none of the main roads out of the tn. was of much use to the enemy as a traffic artery, for the Amers. were astride most of them. But the Gers. still held high ground N. and S. of the Périers-St. Lô road and from these dominating heights poured down harassing artillery and mortar fire, the heaviest barrage theretofore experienced by the Amers. On the next day the Amers. reached the outskirts of St. Lô and on July 18 they took the tn.

The Allies were now ready for the breakthrough, disposing of 30 divs. The Gers. had lost 160,000 men and 30 per cent of their tanks, and few reinforcements were available. Some troops were of indifferent value: of the original 50 divs. of infantry available to the Gers., a number were coast defence formations which included Gers. of low medical category, *Feldersatz*, and Russian and Asiatic ex-prisoners-of-war.

*British Second Army reach Caen.*—The operations in the Evrecy-Esquay area deceived the enemy, and the drive to the S. and S.E. of Caen achieved complete tactical surprise. Following a fierce air assault, the Brit. Second and Canadian First Armies struck across the riv. By July 16 Vimont was reached by the Guards' Armoured Div., Bourguébus by 11th Armoured Div., and a point S. of Dérouville by 7th Armoured Div.

The enemy's resistance then began to stiffen, and he counterattacked S. of Bourguébus with fifty tanks. By night-fall a strong anti-tank screen was established, which halted the Allied advance, on the line Emiéville-Cagny-Soliers. Then the weather broke, and the battle area became a sea of mud which checked further tank operations.

**Anglo-Canadian offensive S. of Caen.**—*Americans take Avranches.*—A new attack was launched S. of Caen on July 25 by Montgomery's 21st Army Group. An area to the W. of St. Lô was blasted by 4700 tons of bombs on the morning of July 25, and the Amer. advance on a three div. front began, whilst S. of Caen the Canadians advanced astride the Falaise road. The Amers. entered Coutances on July 28. The Canadians came up against a strong defensive belt which they began to probe, with heavy air support. After the fall of Coutances the Amer. attack gathered speed. The Sienne R. was crossed on July 29, and on the 31st Avranches and Granville were taken. No effective barrier remained between the Amers. and Brittany, and an open flank had been created.

**American Blitzkrieg through Brittany.**—*Gen. Dempsey takes Villers-Bocage.*—On Aug. 1 the Amers. crossed the Selune riv. and began their sweeping invasion of Brittany. Armoured forces, in three powerful thrusts, struck far ahead of their main forces. One thrust reached Rennes on Aug. 2, while others drove northward, taking Dinan and isolating St. Malo and Combourg. Thus was repeated the successful manoeuvre of Cherbourg. For while the Brit. Second Army gathered against itself most of Rommel's first-class armour, Gen. Bradley's forces were driving swiftly into the peninsula of Brittany. The whole manoeuvre was brilliantly co-ordinated and the immediate result was that in a few days the Ger. line in Normandy had gone and a new extraordinarily confusing type of fluid warfare began to develop, the Allies holding the initiative. The Brit. thrust S. of Caumont made good progress. To the N.E. Villers-Bocage fell on Aug. 5, and to the S.W. of Caen, Evrecy, and Esquay on the 4th. The flank of the Amer. salient was thus protected. Ger. resistance stiffened with the arrival of reinforcements. The Amers. continued their spectacular advance against negligible opposition into Brittany; for their tanks, sweeping 60 m. S. from Rennes in a few hrs., reached the Loire and cut off the whole of Brittany. Other U.S. armoured forces, in an 80-m. drive to the W., reached Brest; while the other three great ports of Brittany—Lorient, St. Nazaire and St. Malo—were completely isolated.

**German counterattack towards Arrancères.**—With the Brest peninsula sealed off by the Amer. advance to the Loire, the main Allied weight began to turn eastward. In quick succession the Amer. Third Army took Mayenne and Laval (Aug. 6), Châteaunaut, and Châteaun-

briant, and then pressed on towards Le Mans on the highway to Paris. Simultaneously the Brit. Second Army advanced through Amay-sur-Ordon to Thury Harcourt on the r. b. of the Orne. With the capture of Mont Pinçon in the Bocage country by the Second Army on Aug. 7, the Allies now commanded nearly all the wooded ridge from the Orne to St. Martin des Bésacés and the S. slopes which fall away towards Condé sur Noireau. Very soon the Canadian First Army, had driven a wedge 5 m. into the Ger. lines and an armour and infantry battle was being fought between Caen and Falaise. Meanwhile the Ger. command made a strong counterattack at Mortain to the E. of Avranches, hoping to find the Allied line weak at the junction of the Brit. and Amer. forces, and to sever the communications of the Third Army. But Gen. Bradley had prepared to meet the expected attack, and R.A.F. rocket-firing Typhoons gave the greatest assistance in destroying the Ger. armour. Not until Aug. 12, however, did signs of a contemplated Ger. withdrawal become apparent, and once again the enemy held too long to a position from which he would have been wiser to retreat. By that date, the decision had been taken to seize the opportunity given by the enemy tactics, and encircle him, Montgomery having apparently taken the initiative in this decision. The Caen sector still remained the most sensitive part of the N. front. On the line of the Laison R. the Gers. held the Canadians for sev. days. Following a heavy air attack this line cracked on Aug. 14th and on the 17th Falaise was at last occupied. Without the heavy, persistent, and bloody battles fought for Caen and for Falaise the rapid advances made elsewhere would have been impossible.

From Paris to the mouth of the Seine every bridge had been destroyed by the Allies excepting those at Le Mans and Oissel above Rouen. The bridges in Paris itself were still intact. But these latter alone were inadequate as a means of escape for a large army with heavy equipment. It was into this trap that von Kluge's Ger. Seventh Army was gradually falling. The Amer. sweep into Angou and Maine had turned the enemy's front and compelled him to extend it; and now the bulk of Third Army was moved eastward to carry out the encircling operation. The sudden double threat to Falaise from the Brit.-Canadian forces and to Alençon and Argentan from the Amers., brought home to von Kluge the danger to his whole Seventh Army. He began to retreat on Aug. 11 and 12, moving perforce for the first time in daylight, and suffering devastating blows from the Allied air forces.

**The Falaise 'Pocket' and the Caen 'Hinge.'**—The Ger. situation was precarious. On the night of Aug. 12, Amer. units had reached Argentan and the Fr. 2nd Armoured Div., Écouche. The vital importance to the Gers. of holding on at all costs at Falaise became obvious, for the mobile Allied right had already swept

right round his main body and had come within 20 m. of making contact with the almost stationary left. The Ger. plan was to line the S. sector through Argentan with armour, against the Amers., while 12th S.S. Panzer and 21st Panzer Divs. estab. an armoured barrier against Canadians at Falaise. A large part of eight panzer divs. escaped, but lost much of their equipment; seven infantry divs., part of an eighth, and some panzer units were trapped. The orderly progress of the retreat collapsed on Aug. 17, when Falaise was occupied, and chaos ensued, intensified by Allied air attacks, on the shrinking corridor. The gap was sealed at Chambois, on Aug. 20, and the pocket was eliminated on the 22nd. The remnants of the Seventh and Fifth Panzer armies fled headlong to the Seine, and there was no possibility of a further stand W. of that riv.

Meanwhile Gen. Patton with 12th and 20th Corps began an eastward dash in a wider encircling movement towards Paris and the Seine. On Aug. 17, Chartres and Dreux were entered. Mantes, Gassicourt was reached by 15th Corps two days later and thus the roads from Normandy to Paris were cut. Ferries alone remained as a way across the Seine for the retreating Gers. Meanwhile, to the S., 12th Corps reached Orleans on Aug. 17, and patrols of 20th Corps entered Fontainebleau on Aug. 20. The tanks then swept around the S.E. of Paris to Melun, other units crossed the Loing and Yonne rivs., and on Aug. 25 12th Corps was 40 m. E. of Troyes. After the elimination of the Falaise pocket, Brit. and Canadian troops, advancing eastwards, soon reached Deauville, Lisieux, and Orbec. By Aug. 30 no Gers. remained W. of the Seine except those shut up in Brittany.

*The End of the Battle of Normandy.*—By a skilful use of pontoons and ferries the Gers. managed to bring 27,000 troops back across the Seine, but the losses inflicted on them were enormous, the concentrations of vehicles and tanks forming an ideal target for the air forces.

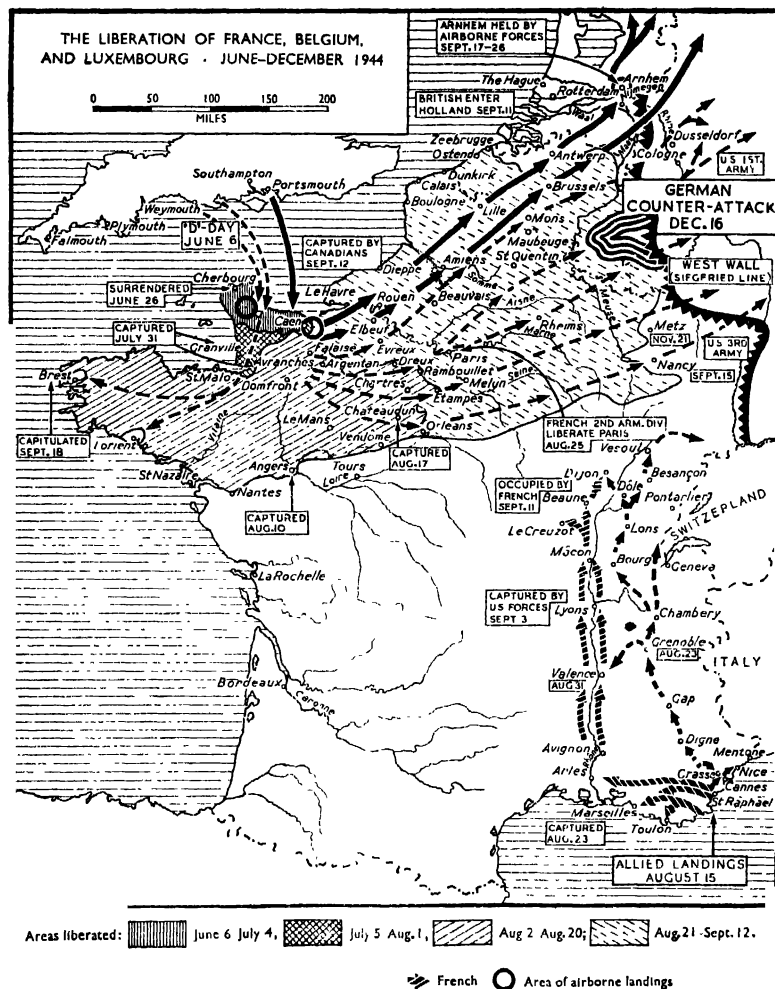
Since the beginning of the campaign the equivalent of 5 panzer divs. had been destroyed and 6 severely mauled. The equivalent of 20 infantry divs. had been wiped out and 12 more badly cut up. Two infantry divs. and a parachute div. were locked up in Brittany and another infantry div. cut off in the Channel Is. By Aug. 25, 400,000 casualties had been inflicted; these included 200,000 prisoners, of whom 135,000 had been taken after the breakout of July 25. 1500 guns, 500 assault guns, 20,000 vehicles, and 1300 tanks had been destroyed or captured, and heavy losses inflicted on the Luftwaffe, over 3000 aircraft being destroyed.

## II. THE LIBERATION OF FRANCE AND THE LOW COUNTRIES.

*Allies Cross the Seine.—Flying-Bomb Sites.*—While the remnants of the Ger. Seventh army were retreating to the Seine, Allied troops were securing cross-

ings of that riv. between Paris and the sea. Sov. Allied forces were now threatening the Ger. line of the Somme, where it was expected that the enemy might try to make a stand to defend the Pas-de-Calais coast. This was of especial importance to the enemy on account of the propagandist value of the 'V1' pilotless or flying bombs (*q.v.*), which for many weeks had been fired over London, and also, of the rocket bombs ('V2', *see* ROCKETS), which it was believed the Gers. were preparing to launch. S. of Paris Amer. forces advanced rapidly, and without meeting much resistance, to the Marne. Soon they were in possession of Meaux, Epernay, Château Thierry, and Soissons. Brit. tanks, with following infantry, moved forward in the whole area between the Seine and Marne. Brit. tanks had split the German Fifteenth Army, now committed to action for the first time, and the enemy, threatened by Canadian and Brit. forces, which had estab. bridgeheads at Elbauf and Louviers as well as Vernon, left Rouen. The Brit. Second Army made the passage of the Seine on Aug. 26-27. Two crossings were developed very well and quickly at Louviers and Vernon and on Aug. 27-28 these bridgeheads were expanded, and an advance started on Aug. 29. The first objective was Amiens, a great communication centre, the capture of which would trap many Gers. between the Somme and the sea.

*Allied landing in Southern France.*—The outer flank of the Amer. sweep was protected by keeping the rest of the Ger. forces in France occupied, by the Allied landing on the Riviera, and by the operations of the Fr. Forces of the Interior under the general command of Gen. Koenig. It was planned that the landing forces should march swiftly northward and eventually make contact with Gen. Patton's Third Army advancing towards the Meuse. Amer., Brit., and Fr. forces under the general command of Gen. Maitland Wilson, landed in the S. of France on Aug. 15, between Nice and Marseilles. The is. of Port Cros and Levant in the bay of Hyères, and Cap Nègre on the mainland were soon taken by Amer. and Fr. troops. Airborne troops, dropped in considerable numbers behind the enemy coastal defences, accounted in part for the light opposition encountered. Only eight days after landing, forces of the Amer. Seventh Army reached Grenoble—a 150 m. advance rendered possible by the activities of Fr. 'maquis' in opening the road to their Allies. By Aug. 24, 17,000 prisoners had been taken, the port of Marseilles was occupied by Fr. troops of the F.F.I., and enemy forces in Toulon were being fiercely assailed by the maquis. Hyères a Ger. strongpoint, also fell on the same day as Marseilles. The advance of the Seventh Army N. along the Rhone valley was maintained against desperate resistance, mainly by 4th Panzer Div. Other Amer. units passed through Nice and headed for the It. frontier. On Aug. 31, the Amers. occupied Valence, while



to the S.W. the Fr. entered Montpellier, Béziers, and Narbonne.

**The Fall of Paris.**—After a four-day battle in which 50,000 members of the F.F.I. under Gen. Koeng, supported by sev. hundred thousand unarmed patriots, fought the Gers. in the cap., the enemy were driven out of most of the chief buildings. But there was desperate fighting even after the F.F.I. had seized the key points and before the Allied forces outside Versailles could join hands with the patriots. On Aug. 24, however, troops of the Fr. Second Armoured Div. under Gen. Leclerc forced their way into Paris

and the next day the Gers. officially surrendered.

**Allied troops cross the Aisne, Oise, Somme and Meuse.**—The Ger. front in N. France had now completely broken, and the battle of France had turned into a rout. The Gers. were now fleeing so fast from the Amer. First Army that it became most difficult for the Amer. forces to maintain contact. The Brit. Second Army was also in pursuit of an enemy in head-long retreat. The Amer. 7th Corps crossed the Aisne on Aug. 29. Armoured columns of Gen. Dempsey's Brit. Second Army seized Amiens on Aug. 31, and estab. a



12-m. bridgehead on the N. bank of the Somme. The Canadians swept along the coast and Dieppe fell on Sept. 1.

Gen. Eisenhower moved his headquarters to France on Sept. 1, and took direct command of all land forces. F.M. Montgomery continued in command of 21 (or Northern) Army Group. Gen. Bradley commanded 12 (or Central) Army Group, comprising the First Army under Gen. Hodges, the Third under Gen. Patton, and the Ninth under Gen. Simpson. On Sept. 15, the forces from the S. became Sixth (or Southern) Army Group under Lt.-Gen. Devers, comprising Gen. de Lattre de Tassigny's First Fr. Army, and Gen. Patch's Seventh Army. Along the whole front from the Pas de Calais to the Argonne the Allied armies drove on towards Belgium, Luxembourg, and Germany, overrunning such historic places as Arras, Vimy Ridge, Laon, Rheims, and Verdun, almost without a fight. The Brit. swept into the Pas de Calais to wipe out a number of the original flying bomb sites. Nowhere were the Gers. inclined to fight. There was a 'pocket' of resistance behind the Allied vanguards in the Compiègne Forest with its important road junction, but even this position was completely outflanked. While Canadian troops were still (Sept. 1) fighting in the vicinity of Le Havre, where the Gers. had strong positions, F.F.I. entered Arras and fought the Gers. there before the arrival of the Brit. troops, which latter then pressed on to Lens, while other Brit. forces were close to Abbeville.

*Allies advance through Belgium and North-Eastern France.—Americans on the Moselle.*—*Lyons taken.*—On the left was Crerar's First Canadian Army advancing through Abbeville and towards Dunkirk, a detachment having wheeled left to isolate Le Havre; next, Gen. Dempsey's Army advancing to Lille and Brussels, then the Amer. Armies under Gen. Hodges and Gen. Patton advancing on Namur and the Moselle respectively. Gen. Dempsey's armoured columns, in a remarkable advance, reached Brussels on Sept. 3, having covered 45 m. in one day. Namur fell on Sept. 4, while Patton's patrols were in the vicinity of Nancy and Metz. Antwerp was taken by Brit. troops on Sept. 4, and this meant that the Pas de Calais was isolated and the last chance which the remaining Ger. troops there had of escaping had gone. Canadian forces were closing in on Boulogne, Calais, and Dunkirk, where Ger. garrisons of some few thousands still remained. With the fall of Namur on the Meuse, the Amer. First Army and the Brit. Second Army were now linked in a double offensive. Amer. and Fr. forces entered Lyons on Sept. 3, and by that date the Gers. had retreated from virtually all S. France, from Lyons westward to the Atlantic. Ger. hopes of making a stand in the Rhône valley at Lyons were dispelled after troops of the Amer. Seventh Army had crossed the Rhône and its trib. the Ain some 20 m. E. of the city. There was still stiff Ger. resistance at Livron, but it was soon reduced. On Sept. 6, the Brit. reached

Ghent. At Louvain most of the bridges across the Dyle were, with the assistance of Belgian resistance forces, captured intact. Sedan was soon enveloped in the Amer. onward surge. First Army units crossed the Meuse on Sept. 4-5 near Dinant and advanced down both banks of the riv. to Liège. The Allied armies in France and Belgium were now massing for a series of assaults on a front of more than 200 m. from the Albert Canal in the N. to Metz in the S. Still further S. the forces of Gen. Patch were in the vicinity of Maçon and Besançon. Patrols of the Seventh and First Amer. armies were now in touch with each other (Sept. 11). This contact realised a continuous Allied line from the Low Countries to the Riviera.

*Allies reach the Siegfried Line.*—Continuing the advance through Belgium the Canadians occupied Ostend and Nieuwpoort, Gen. Hodge's Amer. troops took Liège, and Gen. Dempsey's troops crossed the Albert Canal. On the Moselle, Gen. Patton's troops won sev. bridgeheads. Resistance stiffened as the Allied forces approached Germany, and it was no longer possible to make the swift advances which had brought about the fall of Antwerp. Fr. and Amer. forces took Besançon, on the Rhône-Rhine Canal. Hodge's Amers. liberated the city of Luxembourg on Sept. 10, and in the Aachen area the Siegfried Line came within range of their artillery. The Brit. bridgehead on the Albert Canal, estab. by attacking N.E. from Louvain on Sept. 7, was consolidated. Zeebrugge fell to the Canadians on Sept. 10. On the next day Hodge's troops crossed the Ger. frontier N. of Trier, and in the Aachen area E. of Eupen on the 12th. Bruges, Spa, Malmédy, and Bourg Leopold fell to various Allied forces, and the Ger. garrison at Le Havre, numbering 7000, surrendered to the Canadians on Sept. 12. S. of the Scheldt estuary other Canadians were meeting increased resistance on the Leopold Canal. Infantry of Patton's Army entered Nancy and captured Epinal on the 15th, while Hodge's infantry and tanks broke into the Siegfried Line N. of Aachen, meeting little resistance, but the line of defence extended backwards in considerable depth. Much stiffer resistance was encountered whenever the Allies threatened an advance on the lower course of the Rhine, for that way lay the road into the heart of Germany. Also, on the 15th, Maastricht was liberated by Amers. and Dutch patriots. On Sept. 23, Boulogne, with a garrison of 10,000 men, finally fell, to the Czech Brigade under Canadian command; Calais was taken on the 30th by the Canadian 2nd Corps.

### III. CAMPAIGNS IN HOLLAND.—BATTLE OF AACHEN.

*Airborne Troops land in Holland.*—*German resistance at Nijmegen and Arnhem.*—*Metz encircled.*—A new turn was given to the campaign in Holland on the afternoon of Sept. 17, when strong forces of the First Allied Airborne Army

landed in the Rhine delta as part of an attempt to strike at the N. flank of the Ger. defence line in the W. This was the greatest airborne operation so far launched in the war, more than 1000 aircraft taking part. R.A.F. and Amer. bombers prepared the way with massive assaults on airfields and gun positions. Next day more airborne troops and supplies were poured into Holland, and by the 19th advanced armoured patrols of the Brit. Second Army estab. contact with all the airborne forces except those N. of the Lower Rhine in the Arnhem area. On Sept. 17, the Guards' Armoured Div. had pushed N. against heavy resistance which delayed its advance into Eindhoven, captured by the 101st U.S. Airborne Div. Contact was made on the 18th and the Guards made swift progress to Gave, captured by the 82nd U.S. Airborne Div. which also held the area to Nijmegen, but the Gers. held the tn. and the vital bridge across the Waal. Near Arnhem, the other main landing area, the Gers. launched their most powerful counterattacks, comparable with those in the fighting for Caen. Along the line of Dempsey's advance the Brit. tanks encountered Ger. 88 mm. anti-tank guns and Panther tanks estab. in concrete emplacements, and groups of Brit. tanks had to turn off from the columns to reduce these strongholds while the main body swept ahead. The armoured corridor estab. through Holland to this point was now being fiercely assailed on the flanks and the position of the Brit. airborne troops was becoming critical. Brit. forces were being steadily built up in the area round Nijmegen and Dempsey's patrols were making powerful efforts to estab. firm contacts.

It was also evident that around and beyond Aachen, the Gers. were preparing to make a most powerful stand. There was house-to-house fighting in the factory area of Stolberg. N.E. of Nancy, Patton's troops were engaged in a violent tank battle, while in the battle for Metz his infantry were fighting hard to gain the dominating N.W. heights and so complete the encirclement of the famous city.

*The Battle of Arnhem.*—The crisis in the important battle of Arnhem for the Brit. airborne troops W. of the tn. was now obvious, for Brit. tanks driving N. from the bridgehead at Nijmegen to relieve them were delayed by counterattacks against the bridgehead. The airborne troops at Arnhem had now been holding out for six days against heavy and continuous attacks from all sides; but so long as there was a prospect of relief, the situation, though critical, was not hopeless. Polish airborne reinforcements had now joined the Arnhem men. Other reinforcements were moving along the 40-m. corridor from the Dutch border to Nijmegen to strengthen Dempsey's troops; but the road from Nijmegen northward to Arnhem was a hard one for the Brit. ground troops and Amer. airborne forces who were fighting their way forward against very powerful Ger. infantry and anti-tank opposition. The

situation of the Arnhem men seemed to be improved on the 23rd with the arrival of some forces in amphibious lorries with food and ammunition. Gliders, tugs, and troop-carriers made their way over the Ger. lines to bring what help they could to the beleaguered Arnhem force, but these reliefs met very heavy *flak* all the way from Eindhoven to the Rhine. Meanwhile Canadian forces advanced 10 m. across the Escourt Canal E. of Antwerp in the Turnhout area. The Brit. 'corridor' to the Lower Rhine was cut in a night attack (Sept. 25) but was afterwards reopened, thereby removing a grave menace not only to the Arnhem position but also to the Nijmegen bridgehead. But nonetheless the position of the Arnhem men was steadily deteriorating. On Sept. 25–26 those troops of the 1st and 6th Airborne Div. who could be withdrawn were brought back across the Lower Rhine. 2163 men of the 1st Airborne Div. were withdrawn but 7000 killed, wounded, and missing were lost. Their stand at Arnhem, however, was not entirely fruitless. Apart from inflicting casualties twice as great as their own, the div. achieved a second aim; for at Nijmegen the Ger. forces on the spot were overwhelmed by Brit. ground armoured forces and by Amer. airborne men dropped to the S. of the bridge over the Waal, which was thus secured and put behind the advancing Brit. Second Army. This was so far the most important tactical success that the Gers. had gained in the W. since the opening of the Allied invasion.

Allied strategy had now to be re-adapted to the closing of what looked for a time like a short cut to victory against the Rhenish defences. Positive advantages had, nevertheless been won. The widening of the corridor, in conjunction with other northward attacks estab. a firm line eventually running along the Waal and Maas. A similar extension on the E. brought 21 Army Group in line with 12 Army Group and within striking range of Kleve. Firm bridgeheads across the Waal and Maas had been estab., and the watershed between these two rivers later became a valuable line of approach to the Rhine.

*Fall of Brest.*—Brest (q.v.), in Brittany, which had been closely besieged for more than six weeks, at last fell to the Amers. Some 36,000 Ger. prisoners were cut off in the port and captured. Brest itself was heavily damaged.

*Battle of Aachen.*—*Canadians cross the Leopold Canal.*—There followed a period of more static warfare, with stiffening Ger. resistance. The main centres of attack were between Nancy and Metz, in the Aachen area, and in the Scheldt estuary. At Metz and along the Moselle, tenacious resistance was maintained. But further N. the Amers. had liberated all but a small portion of the Grand Duchy of Luxembourg. Between Aachen and Gellenkirchen the Amer. First Army on Oct. 2 drove a wedge 2 m. deep through the Siegfried Line. By capturing Ubach, S. of Gellenkirchen, they made a definite break through the Line and were now in

more open country E. of those defences. But one of the most urgent objectives of the Allies was to dispose of the Ger. defences on the Scheldt estuary; for so long as these were intact the great port of Antwerp was useless to them. I.C.A.F. bombers therefore began operations by breaching the dyke at Walcheren so as to flood the is. Three days later the Canadian First Army began a general assault towards the S. bank of the Scheldt, establishing a bridgehead over the Leopold Canal. Later, Canadian and Brit. troops landed from the Scheldt behind the Ger. positions in the bridgehead on the S. bank of the riv., thereby easing the pressure on the Canadian forces. By Oct. 10, the Canadian and Brit. troops who had landed behind the Gers. had joined hands, and the combined bridgehead was 2 m. deep and 3 m. wide; while the bridgehead over the Leopold Canal was consolidated, a considerable success achieved in spite of 30 Ger. counterattacks in four days. Meanwhile the great struggle for Aachen was reaching its climax, for the city was almost completely encircled following Gen. Hodge's successful assault on Crucifix Hill, an 800-ft. high feature 4 m. N.E. of Aachen, a position which the Amers. held against many vicious counterattacks. The city was entered on Oct. 13, and was half cleared of the enemy by the 19th, after strong resistance in fortified cellars and buildings. The final surrender of the garrison took place on Oct. 21.

*Conquest of Walcheren and Scheldt Estuary.—Antwerp port cleared.*—The chief task of the Brit. forces was now to clear the Scheldt estuary in order to render Antwerp practicable as a port for direct supply to the Allies. Hence efforts were made by the Brit. and Canadian armies to isolate large forces of the enemy in W. Holland, and, while the Canadian First Army were fighting to clear the estuary and hold the Beveland peninsula, Gen. Dempsey's forces delivered two converging blows in the general direction of s'Hertogenbosch, an important junction on the railway running from the N. to Tilburg and Bergen-op-Zoom and then to Flushing. On Oct. 22, the Canadians captured the port of Breskens and also Eschen, on the Belgian-Dutch frontier, N. of Antwerp. The struggle for s'Hertogenbosch was protracted and bitter, but on Oct. 24, Gen. Dempsey launched his fourth attack, as a result of which Brit. troops fought their way into the tn. Meanwhile the Canadians succeeded in sealing off the S. Beveland causeway where it joins the Dutch mainland. On Oct. 25, Canadian forces captured Fort Frederik Hendrik, the key to the Ger. positions on the S. bank of the Scheldt, and the Ger. forces holding what was the Breskens 'pocket' fell back on their last line of defence in front of the Belgian seaside resorts of Knocke and Heyst. On Oct. 29 the important tn. of Breda was captured by Polish troops attached to the Canadian First Army, and the whole Allied line in S.W. Holland was advancing swiftly forward to the Maas. The

operations to clear the Scheldt undertaken by the Canadian Army were planned to culminate in an attack on Walcheren is., the most heavily-defended area of the approaches to Antwerp. The attacks were to be made simultaneously across the S. Beveland causeway, across the Scheldt from Breskens to Flushing, while a landing was also to be made at Westkapelle mounted from Ostend. By breaching the dyke, heavy bombers of the R.A.F. had previously flooded a large area of the is.; this had resulted in preventing the mutual support of sections of the invading garrisons though enabling the assault troops to make full use of amphibious vehicles. In view of the vital need to clear the Scheldt as soon as possible the Canadian First Army commander decided to launch the Breskens-Flushing attack on Nov. 1, by which time Allied troops would be on the S. Beveland causeway, whether or not the Westkapelle attack, which would be more dependent on weather, could go on. Hence at dawn on Nov. 1, Brit. commandos and Foot Guards landed on the S.W. coast of Walcheren, while Canadians fought their way along the causeway from S. Beveland to gain a footing on Walcheren. Canadian troops also attacked the Knocke-Heyst 'pocket' and stormed their way into Knocke. The Brit. assault troops landed at two places on Walcheren: at Westkapelle they took the vital dyke on which were mounted most of the Ger. heavy naval guns which had for so long been denying the Allies the use of the port of Antwerp, while another series of landings made head-on against Flushing resulted in the greater part of the tn. being in Brit. hands by nightfall. Much assistance was given the assault troops by the rocket firing Brit. Typhoons. Meanwhile N.E. of s'Hertogenbosch (Bois-le-Duc), the Brit. had reached the Maas and were converging on the Ger. escape bridge at Geertruidenburg. On Nov. 3, Flushing was entirely in Brit. hands, and other forces were advancing on Middelburg. To the N., Royal Marines captured Domburg. Heavy fighting was, however, still in progress on the causeway from Beveland. But Ger. resistance on the mainland S. of Walcheren ended with the surrender of Zeebrugge, Knocke, and Heyst, and with these places taken, all Belgium was liberated.

Little resistance was left on Walcheren by Nov. 7. Middelburg had now fallen, 2000 prisoners being taken there. The crowning achievement was the opening of Antwerp to the flow of supplies, for now the enemy had been removed from both banks of the Scheldt estuary, and as the swift descent of the 11th Brit. armoured div. moved earlier had forced the Gers. to leave the dock area intact, the port came into operation with little delay, in spite of flying-bomb and rocket attacks. With the capture of Vrouwenpolder in the N. of Walcheren the enemy's long resistance to the Allied advance westward was at length overcome. Eastward, on the Hollandsche Diep, only a few rearguards were left to fight on the

great Moordijk road and railway bridges.

As a result of the month's campaigning which began on Oct. 6 two Ger. divs. were destroyed and two others most severely handled. The Ger. Fifteenth Army had suffered another crippling blow within a few weeks of its heavy losses during the Allied pursuit across N. France. Allied casualties in these operations were not far short of 40,000 in all.

#### IV. ALLIED ADVANCE ON THE RHINE AND SAAR.

The Allied plan now envisaged an advance by the N. and Central groups of armies to the Rhine, for it was necessary to hold the l. b. of the riv. from its mouth at least up to Düsseldorf before striking across it into Germany.

*Americans beleaguer and capture Metz.*—The Amer. Third Army launched a new attack on Nov. 8, N.E. of Nancy. Despite rain and mud, the Amers. estab. two more crossings of the Moselle N. of Metz. On Nov. 10, the Third Army was advancing all along its front to the N.E. of Nancy. Château Salins, which had been enveloped on both sides, fell on the night of Nov. 9. Even more important strategically was the capture of a 1200 ft. high ridge, the Côte de Pelme, 7 m. N.W. of Château Salins. S.E. of Metz the Gers. were now withdrawing at sev. points, but to the N. of the great fortress in their resistance grew still stiffer, and in one counterattack they made a salient a m. and a half deep in the Amer. bridgehead across the riv. Violent Ger. counterattacks were launched against the flanks of the Amer. Third Army's offensive in the Moselle valley, but failed to halt Patton's advance which now threatened to envelop Metz from the S.E. Due S., Amer. troops were now less than 6 m. from the historic fortress city, the prin. key to the route into Germany by the Moselle gap. Gen. Patton's troops gradually closed in on Metz, and the outer ring of forts fell one by one until the Amers. came within range of the big guns at Metz. On the 17th, Amers. were within less than a m. of Metz, and they entered the outskirts. The city itself fell on Nov. 21-22, but seven of the forts held out, and not until Dec. 13 was the difficult task of reducing them finally accomplished.

*German Retreat ended.*—*Allied attack on the Roer.*—The Ger. retreat had almost ended by the end of Nov., and the Gers. had fallen back on their home bases, with the advantage of their own elaborate frontier networks of strategic railways and arterial motor roads. They had chosen their fronts, as in E. Europe, with a view to the greatest possible economy in manpower. The 'West Wall' (Siegfried Line) was not a line of great forts of the Maginot type; rather was it a fortified zone, incorporating the natural defensive features of the mts. from Hürtgen Forest to the Rhine corridor; and on this whole front of 250 m. there were only two weak spots—that of the Saar coal-basin into which Gen. Patton was now advancing,

and the Rhine corridor (the real entrance to central Germany), where it runs northward from Baden and Strasburg, to Karlsruhe and Neustadt. Von Rundstedt, now in chief command, had reinforced his vital Aachen sector, concentrating against the Allies a dozen first-class divs., of which half were Panzer or Panzer Grenadier, with a group of fresh Panzer divs. in hand for counterattack.

Under a tremendous barrage from 400 guns the Brit. Second Army launched a new attack on Nov. 15, W. of the Maas on the E. flank of the Dutch salient 15 m. S.E. of Eindhoven in the direction of Roermond and they were soon across the Noërder and Wessem canals. A new Amer. army, the Ninth under Gen. Wm. Simpson, had joined the Allied offensive, and the whole western front was now on the move. The Amer. Army of Gen. Hodges also joined in the attack E. of Aachen. In a brilliant combined action by Brit. and Amer. forces, the important tn. of Gellenkirchen, with its network of road communications, was captured on Nov. 19. Meanwhile the Fr. First Army was at the gates of Belfort in the S., and entering Alsace. Next day the Fr. Army, thrusting through the famous Belfort gap, had reached the Rhine between Mulhouse and the Swiss frontier. Belfort itself was entered the same day. While grim fighting continued at the N. end of the battlefront, the Gers. were now faced with a vast turning movement of their S. flank by the army group under Gen. Devers, Strasburg being threatened by a swift Fr. advance beyond Sarrebourg astride the historic route through Saverne. This brilliant stroke by Fr. troops under Gen. de Lattre de Tassigny and the Amer. Seventh Army of Gen. Patch, planned with masterly skill to take the utmost advantage of every defensive manœuvre by the Gers., was executed in appalling conditions of weather and terrain. In the N., at the same time, Amer. First Army troops captured Eschweiler by Nov. 21, while the Ninth Army was within sight of the Roer R. along a large part of their front.

*Campaign in Alsace.*—*Fall of Strasburg.*—*Battles of the Aachen Gap.*—Forces of Gen. Patch's army, including Gen. Leclerc's Fr. armoured div. which had fought as the spearhead of a most remarkable lunge through the Vosges, were fighting in Strasburg on the night of Nov. 23. Owing to the collapse of the Fifteenth Army in Alsace the Ger. resistance was light. Elsewhere the Allied advance towards the Rhine was implacably maintained. The most decisive battle was that being fought in the Aachen gap along the direct approaches to Cologne and the Ger. Rhine; for it was here, at the core of the Siegfried defences, that Brit. and Amer. forces under Montgomery, Hodges, and Simpson were battling their way slowly forward against the best fighting units of the Ger. *Wehrmacht*, and they were doing so in the most unfavourable weather. On this bitterly-contested front some of the fiercest battles were those around Venlo, Jülich, Koslar, Linnich

and Düren, fought in Nov. and Dec. Equally hard was the going in the S. where Patton's tanks were now across the Saar and fighting in a country of woods, hills, and abnormally swollen waterways. But by the end of Nov. most of Lorraine was cleared of the enemy, W. of Metz. Amer. tanks and infantry were now fighting on Ger. soil, and elsewhere the Amers. were in some of the strongest positions of the Maginot line. Saarlautern (or Saarlautern), Saarbrücken, and Saareguemines were now all threatened, for Amer. Third Army forces had reached the Saar at sev. points (Dec. 5), and held a 10-m. stretch of the riv., having overcome determined opposition of every kind. But the major battle was still that which was being fought along the direct route to the Ger. Rhine; yet with Gen. Patch in Alsace, moving down the W. bank of the riv. and Patton in Lorraine gradually closing up the Saar frontier, there were other vital approaches that must soon sap von Rundstedt's reserves. Meanwhile the battle of the Roer was being fought on in foul weather and unending mud, with the Gers. making redoubled efforts to strengthen their defences on the E. bank of the riv., particularly with formidable minefields and mortar fire, and indeed to launch a very dangerous counter-offensive from Monschau. It was at this date that the port of Antwerp was reopened and its use was likely to prove one of the most significant events of the whole war. In a brilliant surprise attack on Dec. 3, the 95th Infantry Div. of Gen. Patton's Army pushed through Saarlautern, captured the main bridge intact, and consolidated their hold on the E. bank of the Saar.

*The Ardennes Counter-offensive.*—The campaign on the W.F. judged by the standards of the mobile warfare of the summer, now however, seemed stationary; although the methodical massing of force opposite the Ger. field fortifications still involved hard fighting. The main battles were brought about by operations to extend the Allied grip on the well-known gateways to the Reich, the gaps of Belfort, the Saar, and Aachen. To deploy the maximum Allied effort in the Aachen sector and to continue the successful progress of the operations in the Saar-Wissembourg area, other parts of the front were lightly held, and, in particular, only four divs. held the Eifel sector of 75 m. between Monschau and Trier. Von Rundstedt had refitted eight panzer divs., received reinforcements from the E. front, and had assembled two panzer armies equipped with the new Tiger and Panther tanks. He had also managed to concentrate a strong air striking force, though he counted on bad weather to reduce air operations to a minimum. The general plan was to break by a blitz offensive the thinly held Amer. front, and drive to the Meuse in the Namur-Liège area, the latter city being a communications centre for Twelfth Army Group. Once this was seized, von Rundstedt planned to drive on Antwerp as fast and as

strongly as possible. If Antwerp fell the supply position of the Allies would become highly critical, and moreover, the Brit. forces with the Amer. First and Ninth Armies in the N. would be isolated from the Amer. and Fr. forces in the S. The Ger. forces were the Fifth Panzer and Sixth S.S. Panzer Armies (10 divs.), and Seventh Army (14 divs.), under von Rundstedt's personal command. Also, one panzer brigade operated in Amer. equipment to spread confusion. Paratroops were dropped throughout the area, especially at Malmedy, while small units and agents attempted sabotage as far in the rear as Paris. The attack began on Dec. 16, and Gen. Eisenhower at once ordered movements of reserves to the flanks of the attack and reserve divs. forward; an important move was that of the 101st Airborne Div. to Bastogne, from S.H.A. E.F. reserve. During the 17th, and 18th, it became clear that a full-scale attack was in progress. Against it, all Allied attacks elsewhere were halted and every available reserve was collected to strike both flanks of the penetration. It was planned to hold firmly the shoulders of the wedge, especially Bastogne in the S. and Monschau in the N., to prevent advances in the Liège-Namur area or W. of the Meuse, and then to counter-attack with Patton's forces in the Bastogne-Cologne direction, followed up with those of Montgomery. On Dec. 19 the command system was reorganised to place all forces N. of the line Givet-Prüm under Montgomery, and all S. under Bradley. The four divs. which received the full force of the attack were by-passed and isolated, but they slowed down the enemy, and the 7th Armoured Div. held St. Vith in the critical early days. The 101st Airborne Div., reinforced with armour, held the vital Bastogne road sector, though they were surrounded by superior forces for five days. Reserves were assembled in rear areas, and infantry divs. brought across the Channel. During the first week the N. shoulder of the wedge was held, and an Amer. corps assembled for the counter-attack. Six divs. were moved from the S. to the N. of the Moselle, and a corps was established in the Brussels area. At Monschau and Echternach the flanks were held, but the westward penetration moved on. From Dec. 16 to Dec. 22, a thick ground fog deprived the Allies of the invaluable air support and the Gers. were able to achieve the maximum surprise. But from the 22nd, paralyzing attacks on von Rundstedt's communications were begun, whilst simultaneously the Third Army began to attack north-eastward from the Arlon-Luxembourg area. By Dec. 26, the 4th Armoured Div. of the Third Army had established a firm link with the defenders of Bastogne, and checked the Ger. advance on that flank, whilst also attracting strong enemy forces from the N. of the salient. By this date also the Meuse sector had been adequately covered, and the failure of the enemy's main intentions was obvious. By the time von Rundstedt's offensive was stopped, he had breached a

gap of 45 m. in the Allied line and penetrated over 60 m. westward to within 4 m. of the Mouse near Celles. On Jan. 3, the First Army attacked from the N. towards Houffalize, through which ran the Ger. supply route. The Brit. 30th Corps conformed on its right. Towards the same point the Third Army from the S. launched an attack on Jan. 9. By Jan. 10, the two attacks were within 10 m. of each other. The Gers. had now begun to withdraw from the W. tip of their salient whilst trying to hold the N. and S. flanks. The First and Third Armies estab. firm contact at Houffalize on Jan. 16 and turned eastwards. St. Vith fell on Jan. 23, and by the end of the month the Allies were back on their original line with advance forces attacking beyond. The result was that the Allied offensive against Germany was delayed by at least six weeks, and also, the strategic Air Force had had to neglect its targets deeper in Germany for about a month. Though von Rundstedt had conducted his retreat skilfully, his losses were heavy. By the end of the Allied counter-blow, the enemy had lost 220,000 men including 110,000 prisoners of war, 600 tanks and assault guns, 1620 aircraft, and large numbers of motor transport were also lost.

*German offensive in Alsace.—The battle for Colmar.*—Meanwhile Alsace presented a picture of confused fighting. The great Haguenau forest, having little in the way of natural defences, was yielded by the Amers., who had taken up better positions S. of Bitche, which had been the scene of bitter fighting. In Colmar the Gers. had built up a formidable 'hedgehog' position, but Gen. de Tassigny's Fr. Army late in Jan. delivered new attacks N. and S. of the Ger. position. On Jan. 25, von Rundstedt launched his expected offensive in Alsace and, to the W. of Haguenau, crossed the Moder R. and cut the railway through the N. Vosges to Sarreguemines; but his attacks were held. During the same week the Brit. advanced towards the Roer R. from Holland and captured Heinsberg, the biggest tn. in the triangle between the Maas and Roer rivers; while the Amer. Ninth Army on their right took Brachelen. The Gers. were now falling back from the Ardennes bulge to the Siegfried defences. Troops of Patton's Third Army had now crossed the Our R. into Germany. The Fr. in Alsace were close to the outskirts of Colmar. At the end of Jan. the Amers. were steadily advancing against the 40-m. stretch of the Ger. frontier between Morschau and Echternach. Far from developing his vaunted attack in N. Alsace the enemy was faced with the Fr. Army's flanking manoeuvres on the Colmar 'pocket'; while Allied forces stood solidly on the line of the Roer with the threat of further incursion across the Ger. frontier by Amer. forces which, in snow and bitter cold, were methodically following up the Ger. retreat from the Ardennes. On Jan. 31 vanguards of the Amer. First Army crossed the Reich frontier and estab. themselves within 2 m. of the Siegfried Line. On Feb. 1 in N. Alsace troops

of Patch's Seventh Army crossed the Moder in force and entered Oberhofen, S.E. of Haguenau and, on the same day, Gen. de Tassigny's army drove through the Ger. corridor N. of Colmar and, at night, his troops and tanks were on the Rhine, N.E. of the city. The Fr. Army, together with Amer. forces under de Tassigny, reached the centre of Colmar on Feb. 2, thus sealing the fate of the formations of the Ger. Nineteenth Army remaining in the so-called pocket. To the N. and W. of Mulhouse the Ger. main route of supply and retreat was cut by forces advancing on Neuf-Brisach astride the main Colmar road. On Feb. 4, Fr. and Amer. forces met in the centre of the Colmar 'pocket' cutting the Ger. forces in two, while all the Gers. remaining in the Vosges were surrounded. By Feb. 9, the Colmar 'pocket' was eliminated and organised resistance there was ended. Gen. Patton's forces broke clean through the main Siegfried fortifications 4½ m. N. of Prum on Feb. 5. Two days later Amer. troops crossed the border on the Ardennes front at numerous points from near Clervaux to Echternach over the Our R. and were at once up against the Siegfried defences.

*Plan of Operations to reach the Rhine.*—It was planned that in operations W. of the Rhine the main effort was to be made in the N. sector looking to the seizure of crossings N. of the Ruhr. Three distinct phases were envisaged, viz.: (1) the Canadians and the Amer. Ninth Army were to close up to the Rhine N. of Düsseldorf whilst the Amer. First Army seized the line of the R. Erft W. and N.W. of Cologne. The offensive in the Ardennes was to be reduced, the Gers. contained, and the breaches in the Siegfried Line developed. (2) Whilst in the N. the Rhine-crossing was prepared and accomplished, the Gers. were to be forced back to the riv. N. of its confluence with the Moselle, and when this was done the S. forces were to capture the Saar basin and advance towards the Rhine. (3) Whilst the N. bridgehead was developed and the central group of armies held a defensive position N. of the Moselle, the remaining S. forces were to close up to the Rhine.

*Canadian-British Offensive in the Reichswald.*—The Canadian First Army under Gen. Crerar, with large numbers of Brit. troops, launched the offensive between the Maas and the Rhine as planned on Feb. 8. Gen. Crerar's army was fighting in most difficult country, especially as the Rhine, running only a few m. E. and N. of the Reichswald forest, constituted a tremendous obstacle aggravated at this season of rain and floods. Scottish troops entered Kleve on Feb. 11; but though the Canadians took Millingen on the Rhine they were much hindered by floods and, by blowing up dykes, the enemy had increased the riv. floods. Next day Brit. troops took Gennep, an important stronghold, and Crerar's forces were now through the outer Siegfried defences. A day later most of the Reichswald had been cleared. Meanwhile the Amer. First Army, having taken Schmidt, were

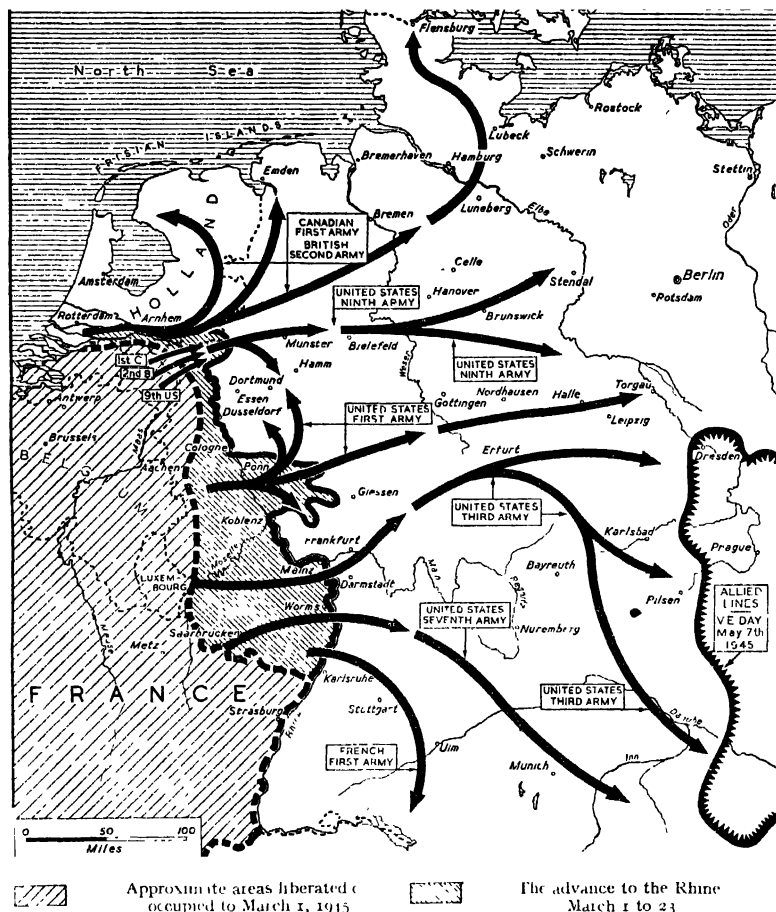
fighting for the reservoir system and the great Schwammeneau dam; and the Amer. Third Army had crossed the Prüm and fought their way through the Schneefeld forest. In the reservoir area the Amers. soon cleared all Ger. troops from the l. b. of the Roer, while the Schwammeneau dam was under Allied control, though not intact, by Feb. 10. The Third Army, which was fighting on the banks of the Sure and Our, were faced by swollen and swiftly-flowing rivs. Yet the Amers. had secured at least ten crossings on a 24-m. crescent and were estab. on Ger. soil near Echternach. Troops of the Third Army entered Prüm on Feb. 12. The Canadians, in spite of a number of Ger. counterattacks, made good progress S. of the Reichswald. Brit. troops had completed their task of fighting a way through the Reichswald, and the enemy, consisting of elements of seven divs., had withdrawn to the next Siegfried belt through Hochwald, while still holding the important positions of Goch and Kalar in advance of that belt. Scottish troops of the 1st Canadian Army, were battling relentlessly from house to house through Goch. On Feb. 19 the Gers. were surrounded. Next day Patton's troops in a sudden thrust between the Moselle and Saar, captured Suresbourg and a score of other tns. and vils. On Feb. 22, Brit. and Amer. bombers made their biggest bid to wreck the Ger. railway system. This tremendous air onslaught was the prelude to the offensive of the Amer. First and Ninth Armies across the R. Roer, E. of Aachen. The same day (Feb. 22), the Third Army crossed the Saar at sev. points.

On the next afternoon Hodge's First and Simpson's Ninth Armies launched a surprise offensive across the R. Roer E. of Aachen. The following day the two Armies broke into the Rhine plain about 18 m. from Cologne. Tanks and guns were moved across the Roer and a bridgehead secured on a 30-m. front. The fall of the bastions of Jülich (Feb. '4), and Düren (Feb. 25), sealed the fate of Cologne, particularly as the overwhelming power of the Brit. and Amer. air forces, in isolating the enemy on the battlefield, prevented him from delivering any determined counterattacks. On Feb. 26, the First Army was within 12 m. of Cologne, while the Third had advanced up to 7 m. N. of Echternach and repulsed seven desperate counterattacks across the Saar. Next day Crerar's Canadians penetrated into the last belt of the Siegfried defences in the Hochwald, which lies between Goch and Xanten; while Amer. troops were advancing on Munchen-Gladbach, and had reached the R. Erft. Cologne was now under fire from Amer. guns, forces of Simpson's army having secured three bridgeheads across the Erft, one of them at Modrath on the main Cologne-Düren road. Approaching behind the main Siegfried fortifications E. of the Saar, Amer. armoured columns of Patton's army entered the outskirts of the anct. city of Trier on March 1. Munchen-Gladbach was captured on March 1st.

Swiftly on this success the Ninth Army captured Krefeld and Roermond. In addition to these places, the long and bitterly contested strongholds of Venlo fell to them, thus outflanking at last the barrier of the Maas; and further S., Patton completed the capture of Trier.

*Fall of Cologne.*—In the N. part of the Allied line the fiercest fighting was now in the E. of the Hochwald, where the Gers. were striving to cover the Rhine bridges at Wesel, 20 m. N.W. of Essen. The momentum of the whole campaign was ever increasing. Amer. armour and infantry were at the very gates of Cologne (March 4). The whole Allied line, now that the Siegfried defences had been largely overcome, was fast closing to the l. b. of the Rhine, and the enemy forces still remaining W. of the riv. were being split and destroyed in detail. Most of the organised Ger. resistance still maintained on the l. b. was now manifestly intended to cover vital crossings to Wesel and Duisburg. Brit. troops in Crerar's command joined up with Ninth Army forces at Geldern, thus carrying a stage further F.-M. Montgomery's plan to crush the Ger. First Parashute Army. Moreover this junction at Geldern with the Brit. had carried a long way further the envelopment of the whole of the enemy forces between the Maas and the Rhine. For after the Hochwald had been cleared the Gers. were reduced to a bridgehead 20 m. by 10, from a point opposite Duisburg to the W. of Xanten, these being virtually the last Rhine bridges available to the enemy. After the passage of the Erft Cologne had ceased to have much tactical value for the enemy, for Allied forces now stood along the riv. between Cologne and Düsseldorf and were also threatening the city from N.W. and W. Amer. tanks and infantry broke through the outer defence belts into Cologne on March 5 and took two suburbs. The city was finally in Allied hands on March 7. As the Allies had desired, von Rundstedt had fought his main battle W. of the riv.

*The Remagen Crossing.*—*Rhineland bombing.*—A junior Amer. officer, Lieut. Burrows, made a crossing of the Rhine by a bridge at Remagen, on Mar. 7, only ten minutes before the Gers. had planned to destroy it. His platoon of infantry maintained its position on the r. b. until units of the 9th Armoured Div. consolidated the position. By Mar. 9 a lodgement area 3 m. deep was held. Enemy reinforcements failed to contain it; as it grew the vital N.-S. autobahn was cut. By Mar. 24, when the main eastward attack in the N. was begun, an area 10 m. deep and 25 m. long was held, with three corps within it. Meanwhile, the junction between the Amer. First and Third Armies on the Rhine was firmly estab. by Mar. 10th, with the result that some ten enemy divs. were enveloped. In a savage battle to the N. the Brit. fought their way into the anct. city of Xanten while the Canadians were driving up to the S. of the city. The Amer. grip was extended on the l. b. of the Rhine below Coblenz. Northward,



THE ALLIED ADVANCE INTO GERMANY, 1945

A map showing Russian advances in the East is printed in the article EASTERN FRONT.

the notorious salient at Wesel was at length wiped out by the Canadian First and Amer. Ninth Armies. Thus the Allies now stood on the line of the Rhine the whole way from Nijmegen to Coblenz. Throughout these operations the Allies had ceaselessly carried out strategic bombing of Rhineland industrial centres.

*German First and Seventh Armies annihilated in Saar-Moselle-Rhine salient.*—The Ger. still held a large triangle of territory between the Saar, Moselle, and Rhine. But Gen. Patton's forces were now converging along the N. bank of the Moselle from the direction of Trier and Coblenz respectively, and steadily reducing the gap

of escape across the Rhine to the S., while Gen. Patch's forces were preparing to attack the triangle from the S. The Ger. Seventh Army having been scattered by Patton in the Eifel and driven southward into the river triangle, the Ger. First Army was now the only stable enemy command left W. of the Rhine. The combined offensive of the Amer. Third and Seventh Armies (phase 3) now grew ever more menacing. Patton's army crossed the Moselle S.W. of Coblenz, while the Seventh Army struck frontally at the remaining Siegfried defences between the Saar and Haguenau preparatory to recovering all the places lost in the



enemy's recent counter-offensive in the Palatinate. The 4th Armoured Div. now began its advance to threaten the entire Ger. salient (16 Mar.). Another armoured div. was thrown in soon afterwards to exploit the mounting confusion of the enemy. The Third Army now had four tank divs. thrusting through the broken ranks of the Ger. Seventh Army; while Patch's army kept the Ger. First Army impotent by battering it back into the Siegfried Line and crowding into the outer defences in a non-stop onslaught. Along the Saar line Patch's forces in a furious attack penetrated the Siegfried's concrete defences and began to outflank Saarbrücken (Mar. 18). Coblenz was carried by storm on Mar. 18, and Amer. tanks entered Bad Kreuznach and Bingen. Saarbrücken and Zweibrücken were taken by Patch on the 20th, while Patton's forces reached Mainz and the ancient city of Worms and passed through the vital centre of Kaiserslautern 12 m. W. of which place the Third and Seventh Amer. Armies had joined hands. The entire Ger. forces in the salient were now demoralised and racing for the Rhine with Amer. tanks hard on them and fighter-bombers attacking them. On Mar. 21, Patton's army entered Ludwighafen, as the Ger. remnants in the narrowing salient tried to escape across the riv. Patton's aggressive tactics reached their peak on Mar. 22 in a surprise night crossing of the Rhine, the 5th Div. being sent over without any formal preparations and with negligible losses. Thus, two bridgeheads were already held before the main assault of 21st Army Group was attempted.

All organised resistance W. of the Rhine ended by Mar. 25, and phase (3) of the operations to close the riv. was completed. The operations had gone entirely according to plan, with the additional gains of the rapid seizure of the Cologne area, and the estab. of two bridgeheads. The Ger. armies needed to man the last barrier were shattered to the W. of the riv.

#### V. FINAL ALLIED ADVANCE ACROSS GERMANY.

*Preparations* - The Allied strength on the W.F. now reached almost four million men. The Ger. position was precarious, and their strength inadequate to man the Rhine barrier. The features of the Allied plan were a main attack to the N. of the Ruhr, aided by a strong secondary drive from bridgeheads around Frankfurt towards Kassel, thus enveloping the Ruhr. Three armies were to be used in the main N. assault. The Brit. Second Army was to attack N. of Wesel, capturing the tn. to allow the Amer. Ninth to begin bridging there, the two forces then expanding the foothold gained. To assist Second Army the 18th Airborne Corps were to be dropped in the key area N. and N.W. of Wesel. On the left flank the Canadian Army was to hold the Rhine and the Maas from Emmerich to the sea. The air arm had a most important task,

namely to isolate the Ruhr from the rest of Germany, and to deny the use of its resources to the enemy. Their main effort began on Feb. 21, 1945. Ten of the eighteen vital bridges and viaducts were destroyed by Mar. 24, and the communications centres of Dortmund and Essen were heavily raided on Mar. 11 and 12.

*Montgomery Crosses the Rhine.*—At 8 p.m. on Mar. 23, an artillery barrage lasting an hour opened the offensive. At 9 p.m. the Brit. 1st Commando brigade began the assault on Wesel, and, so accurate and heavy had been the air assault, captured it for 36 casualties. The next night four major landings were merged in a solid bridgehead 7 m. deep. 8000 prisoners were taken, and complete contact was soon made with the airborne forces who had landed during the morning. In a day both Dempsey's Second Brit. Army and Smith's Ninth Amer. Army had floating bridges over the wide swift-flowing Rhine, an outstanding feat of military engineering. Enemy resistance was remarkably light, due largely to the combined weight of air and artillery preparation on a massive scale, and to Allied air supremacy over the battle-area. On the 25th there was stiff fighting near Emmerich, it being the obvious intention of the Gers. to hold the front there against a probable Brit. attack northwards into Holland; but N.E. of Wesel the Brit. advanced almost unopposed after taking Brunen. There was also very stiff fighting for Rees but the tn. was finally cleared by Scottish troops. Meanwhile the Ninth Army was threatening the whole region S. of the Lippe Canal flowing eastwards from the Rhine near Wesel. The Amer. First Army had concurrently advanced southwards 35 m. from the Remagen bridgehead while the Third Army tanks, from new bridgeheads at Boppard and N. of Braubach, had entered the suburbs of Frankfurt-on-Main and penetrated into Bavaria. In the far S., Patch's Seventh Amer. Army crossed the Rhine S. of Worms on March 26th. On April 1, the Fr. estab. a foothold across the riv. at Phillipsburg, and built up a base from which later to attack S.E. towards Stuttgart, and to clear the r. b. up to the Swiss frontier.

*Kesselring's Armies in Retreat.*—Von Rundstedt, having been reinstated to carry out the Ardennes offensive, was again dismissed when the Allies crossed the Rhine, and Kesselring was brought from Italy to face the task of holding the Ger. armies together. As reinforcements of men, guns, and armour flowed across the Rhine, the vanguards of the Brit. and Amer. forces under Montgomery were steadily expanding the Westphalian bridgehead and so putting the crossing sites beyond the range of enemy artillery. It was now evident that the main Ger. defence line had been broken in crossing the Rhine and in the N. sector of the Allied advance the Ger. front appeared to be collapsing, though Montgomery's major attack was yet to come. The Canadians were steadily moving on towards Emmer-

ich, while the Brit. advanced on Isselburg. Organised Ger. resistance on the centre and S. parts of the front opposite the 21st Army Group had, for the time being, ceased to exist, and the same could be said of the front opposite Gen. Bradley's 12th Group. Realising the peril to the Rhine front, some time previously the Gers. started digging intensively on a line running S. from the point where the Enns enters the Dollart, S. of Emden, down to the Dortmund-Enns canal and thence along the line of the Lippe to the Rhine itself and Wesel. But already Brit. and Amer. troops were astride the Lippe and Ger. power was dwindling so fast that it was difficult to say whence forces to man this line were to be found. On the 28th, with the Allied armour driving E. in great strength, the whole of Kesselring's front was now in retreat, in places becoming a rout. As the Ger. columns fled eastward Brit. forces of the 6th Guards Armoured Brigade captured Dorsten 20 m. E. of the Rhine. In the S. Patton's forces, which were now clearing Frankfurt, reached Gemünden in their drive from Aschaffenburg; while Patch had advanced to the Main, E. of Worms. Next day Montgomery's forces were 40 m. beyond the Rhine. On their N. flank the Canadians took Emmerich on March 30; in the S. forces of the Amer. Ninth Army, advancing 130 m. in 5 days, had captured Paderborn, 60 m. S.W. of Hanover and outflanked the Ruhr valley in the S. Gen. Patton's tanks in swift thrusts, were overwhelming the enemy, and at Lauterbach the Amers. were only about 200 m. from Berlin. On the same date Patch's infantry occupied Heidelberg.

*The Ruhr Encircled.—Fall of Munster.*—By the junction on April 1, of the Amer. First and Ninth Armies near Lippstadt (N.E. of Hamun), the encirclement of the Ruhr was completed. Some twenty-one divs. were trapped. On the 14th the pocket was divided at Hagen, and on the 18th it was finally eliminated. Prisoners numbered 325,000, including 30 general officers. The main front was by this date over 100 m. to the E.

Three main avenues for the advance into Germany were available: first, across the N. Ger. plain to the Baltic and Berlin; second, from Kassel, through Erfurt and Leipzig, to Dresden, cutting in two the remains of the Reich; third, through Nuremberg and Regensburg and via the Danube into Austria. Gen. Eisenhower selected the second as the most effective, to be supported by more limited operations to the N. and S. by F.M. Montgomery and Gen. Devers respectively. When the central thrust met the advancing Red Army, the chief task would be to reach the Baltic and clear the whole N. area, and then to drive down the Danube into the Alpine Redoubt which Hitler intended to garrison with as many of his forces as possible. From Holland to the State of Baden more than 12 armoured divs. drove deep into Germany. The vanguard of Montgomery's forces were already over 80 m. beyond the Rhine.

Roads from the N. of Holland were seen to be packed with transport of Ger. troops moving out of the country. The much-bombed city of Munster was entered on April 2 by Brit. and Amer. forces of the 21st Army Group and, at the same time, the Brit. 6th Airborne Div. crossed the Dortmund-Enns Canal and advanced on Osnabrück. Further W., Rheine, centre of an airfield system, and Enschede, the Dutch border tn., were occupied. Patton's infantry advanced to the outskirts of Kassel.

*Allied Advance to the Weser.—Hamm Captured.*—Montgomery made a general advance to the Weser, where the enemy was frenziedly building defensive positions, though his line was already being turned by Amer. armour operating in Thuringia and Bavaria. Columns of Patton's armoured forces entered Gotha on April 2, after an advance of 20 m. through the N. fringe of the Thuringian Forest. Advancing along the Dutch border to capture Nordhorn, the Canadians crossed the Twente Canal thus threatening all the Ger. supply-lines into Holland. On April 3, the Brit. 11th Armoured Div. reached the outskirts of Osnabrück. Thus, with Rheine and Munster cleared, the enemy had lost the use of the group of fighter-airfields within the Rhine-Munster-Osnabrück triangle on which the Allied air forces had concentrated so many fierce attacks before the crossing of the Rhine. Twenty m. S. of Munster the tn. of Hamun, whose vast railway marshalling yards had been bombed repeatedly for years, was entered by the Amer. 83rd Infantry Div. Forces of the same Amer. Army, the Ninth, also captured the tn. of Recklinghausen and part of the Teutoburger Wald which skirts the railway centre of Bielefeld. On April 4, Montgomery's forces were on the line of the Weser near Minden, on the most direct route to Berlin, though Gen. Patton's columns in Thuringia were still nearer the cap.

*Americans take Kassel and Gotha.—French take Karlsruhe.*—Further S., Gen. Patch's tanks were less than 40 m. from Nuremberg; while in the extreme S. the Fr. Army in Baden entered Karlsruhe on April 4. Thus, from Holland to Switzerland, operations were in swift progress to engulf the whole *Wachmacht* in disaster. Yet there were still large if isolated pockets of resistance, notably the line of hills before Osnabrück, called the Teutoburger Wald, although this had been outflanked; and also the line of the Issel, the W. side of which had been built by the Dutch as a defence against invasion from Germany. Kassel, Gotha, and Suhl were all cleared by Patton's forces by April 4, and within the succeeding week the main advances to the E. were begun.

*Allies Across the Hanoverian Plain.—Canadians Advance into Holland.—Bre-men captured.*—Tanks and infantry of the Amer. Ninth Army crossed the Weser, S. of Hameln on April 6. Units of the Brit. 11th Armoured and 6th Airborne Divs. held a long stretch of the W.

bank near Minden. The 7th Armoured Div. was approaching Bremen. Canadian armour crossed the Twente Canal and advanced N. of Almelo. More Brit. and Amer. tanks had crossed the Weser in sev. places next day and the highway to Hanover lay open before them. The Brit. and Canadian armies under Montgomery were now engaged in a great faunting manoeuvre spreading N.E. across the Hanoverian plain and N.W. against the enemy's last strongholds in Holland, which latter were now closely threatened by a rapid advance of Canadian armour in the direction of Groningen. Allied parachute troops were dropped over Drenthe and Friesland E. of the Zuider Zee (April 7), while farther S., Zutphen was also captured. By now the city of Hanover was almost enveloped by Allied tanks, while a Brit. column was closing on Bremen. Fifty m. to the S. of Hanover Amer. troops cleared Göttingen. Between Kassel and Muhlhausen the enemy made lunges at the Third Army's flank, but without avail and at heavy loss to himself in armour. An advance by 10th armoured div. of the Seventh Army, which drove forward S.E. of Würzburg, to within 20 m. of Kralshelm on April 7, had temporarily to be abandoned in face of enemy pressure. There was bitter street fighting in Heilbronn until April 12, but the area within the great loop of the Main R. near Würzburg was now largely cleared and Amer. tanks were making for Schweinfurt. Forces of the First Fr. Army, advancing on the line of the Neckar, took the important traffic junction of Pforzheim, while other units, advancing on Stuttgart, seized the enemy broadcasting station, which lay outside the city. S. of Bremen the Gers. strongly contested the advance of 30th Corps; the outskirts of the city were reached by April 22, and opposition was finally crushed on April 26.

*Allied Advance on the Elbe—Hanover captured.—N.W. Holland isolated.*—The left thrust of the Allied offensive was now driving across the N. plains of Germany towards the Elbe, the last natural barrier on the road to Berlin, and the 11th armoured div. reached it at Lauenberg on April 19. Further N. 12th Corps reached the S. bank opposite Hamburg on April 20. Hanover, vital as a Ger. communications centre, was captured on April 10 by Simpson's army. Amer. armour, advancing S. of the city, on this day cut the motor road to Brunswick at a point about 20 m. from Hanover. Meanwhile Crerar's Canadians had made much progress in isolating the remaining forces in N. Holland, as the result of masterly manoeuvres. Pivoting on Arnhem (not yet taken), a wide wheeling movement had been made to the line of the IJssel, while armoured columns were thrusting due N. to the sea, amidst considerable difficulties in flooded terrain. Bitter resistance was encountered on the approaches to Deventer, which fell on April 10th, and Zwolle. The Gers. W. of IJssel were now cut off in a swiftly-closing pocket that contained nearly all the prin. cities of Holland.

*The Americans reach the Elbe.—Fall of Essen, Schweinfurt and Coburg.*—The Ninth Army continued its N.E. advance which it had begun under 21 Army Group after its successful envelopment of the N. Ruhr. Its 19th Corps reached the Elbe, S. of Magdeburg (70 m. from Berlin), after a more or less unopposed advance of 50 m., on April 11. The same day the Amer. 17th Airborne Div. attached to the Ninth Army had completed the capture of Essen. Amer. troops of the Seventh Army entered Schweinfurt from two directions, but severe fighting followed their entry. Patton's troops, on this date, captured Coburg and entered the outskirts of Erfurt.

*Americans take Weimar.—British and Canadians in Arnhem.*—The 2nd Armoured Div. of the Ninth Army crossed the Elbe early on April 12. Patton's forces captured Weimar, while one armoured column crossed the Saale 24 m. S.W. of Leipzig, by-passing Jena. Scottish troops took Celle on the main Hanover-Bremen railway. Dempsey's troops crossed the Aller S.E. of Bremen. In the S. Patch's forces finally cleared Heilbronn after a week-long battle. Brit. and Canadian troops made a new crossing of the hotly-contested IJssel and entered Arnhem on April 15. Brit. troops were now approaching Belsen (q.v.), 10 m. N.W. of Celle. Canadian reconnaissance troops reached the N. Sea near the Ems estuary on April 15th, and occupied Leeuwarden. The Ger. escape route across the Zuider Zee along the N. causeway was now outflanked. The enemy withdrew behind the Grebbe and New Water lines into 'Fortress Holland' and no further Allied advance was attempted. The destruction of the Ger. forces still at large was the main concern.

*French combined operation in the Gironde.*—A combined assault was launched on April 14 against some 20,000 Gers. still entrenched at the mouth of the Gironde covering Bordeaux. More than 2300 Amer. heavy bombers attacked the naval fortifications at Royan and the Pointe de Graves at Le Verdon, while the land attack was opened by Fr. troops under Gen. de Laminat. A Fr. naval task force under Admiral Rue bombarded the coastal batteries which commanded the entrance to the estuary. This was the first time since 1940 that the Fr. navy had put a completely national force into operation. On April 15, troops of Gen. Leclerc's armoured div. entered Royan, the strongpoint covering the mouth of the Gironde from the N. Fighting in this sector ceased on April 18th, and on the 21st Pointe de Graves, on the S. bank, was captured. The is. of Oléron fell on May 1. Further N. the St. Nazaire-Lorient 'fortress' held out until the final Ger. surrender.

*Leipzig taken by the Americans.—Czechoslovakia reached.*—To the W. and S.W. of Leipzig the enemy resisted strongly, although Allied penetrations had been made to the S.E. After two days of hard fighting the 69th div. cleared the city on April 19th. The Amers. also

made an end of the enemy's strenuous resistance in Halle. The 15th Corps reached Nuremberg on April 16, but the town held out until the 20th, owing to bitter resistance of the 17th S.S. Panzer Grenadier Div. Allied units closed up to the R. Mulde. S. of the Harz Mts. the First Army offensive, begun on April 11, progressed with speed against usually limited resistance. Dessau was reached on April 14, this thrust almost surrounding a pocket of some 10,000 Gers. in the mts. Helped by difficult country they held off the Allies and maintained a corridor to the E. This was cut on April 18, and organised resistance collapsed three days later. A rescue attempt across 50 m. of Allied-held ter. by the von Clausewitz Panzer Div. was frustrated. On the Third Army front, whilst 20th Corps advanced to the N. of Czechoslovakia, 12th and 8th Corps drove towards the S.-W. frontier, and units entered the country on April 18. The junction with the Russians which cut Germany in two and achieved the object of the central thrust, was effected on April 25th, when the 273rd regiment of 69th div., probing eastward from the R. Mulde met units of the Russian 58th Guards Div. on the Elbe in the Torgau area.

Troops of de Tassigny's army, E. of the Rhine, almost completely turned the Ger. positions in the Black Forest and advanced to Tübingen, whence a column swiftly raced up the Upper Neckar valley to capture Rottweil near the Danube.

#### THE LAST PHASE.—*The General Situation.*

The junction of the W. and E. fronts at Torgau split the Ger. forces into two unco-ordinated sections, in both of which a weaker resistance became apparent; over one million prisoners had been taken by the W. Allies in the first three weeks of April, and such losses made collapse inevitable. The administration of the entire country, moreover, was paralysed. The 'National Redoubt' was a major question in the minds of the Allied command. This area, some 240 m. by 80 m. in W. Austria with small parts of Germany and Italy, was extremely mountainous, and though the junction at Torgau prevented the main body of the Ger. Gov. reaching it, there remained the possibility that the more fanatic elements in the S. part might make a last stand there. In the N. part some 50 Ger. divs. remained, the First Parachute Army being the only formidable troops. To prevent a withdrawal into Denmark and Norway, a rapid drive to the Baltic became the primary objective. On the central sector the main Allied forces were halted on the Erzgebirge and the Mulde and Elbe rvs., chiefly because of supply factors.

Whilst the central forces were halted, those to the N. and S. were further to subdivide the enemy and neutralise the possible areas of resistance. Thus 21 Army Group, having crossed the Elbe, was to take Hamburg and advance as fast as possible to the Kiel-Lübeck area,

and afterwards liberate Denmark. Meanwhile, the coastal belt was to be cleared. In the S. a similar thrust was to be made down the Danube valley to Linz by the Third Army. In addition Salzburg was to be taken, and the Seventh Army was to advance on Munich and penetrate the mts. of the fortress area. The Fr. Army was to clear the Black Forest and the Swiss border.

*Operations in the North.—The British take Bremen and Hamburg.—Conditions in Holland.*—The Brit. Second Army met steady resistance in its drive towards Bremen and Hamburg. After the fall of the former, on April 26, the main effort was transferred to the 8th Corps, which crossed the Elbe at Lauenberg on April 29, and rapidly developed a bridgehead. The Amer. 18th Airborne Corps, fighting as ground troops, crossed to the S., and gave flank protection for further advances. On May 1st, 11th Armoured Div. set out from the bridgehead, moved swiftly across Schleswig-Holstein and entered Lübeck on May 2nd, cordoning off the enemy in Denmark. On the same day the Brit. 6th Airborne Div. arrived at Wismar, further E., and inland Schwerin was taken. Meanwhile other forces moved down the E. bank of the Elbe and occupied Hamburg on May 3rd, whilst the region between the Elbe and the Weser was cleared of the enemy. Contact with the Red Army was established on May 3rd from Wismar to Lake Grabow. By the end of April the enemy abandoned the fight against the W. Allies, and tried to make a last effort to hold the Russians, but without success. Wholesale surrenders took place to the Amer. units halted at the Elbe, whilst Second Army drove unopposed to the Baltic. The Canadian Army continued mopping-up operations in Groningen prov. and the coastal belt, and Oldenburg fell on May 2nd after strong resistance. W. of the Isselmeer the situation was delicate. The civil pop. was threatened with starvation, the Gers. were strongly placed, and moreover would have opened the dykes and flooded the country if an Allied assault were made. Seyss-Inquart, the Nazi commissioner, offered a solution by proposing that the Allies should stand on the line of the Grebbe, whilst the Gers. allowed relief supplies to be introduced, ceased repressive measures, and made no further flooding. This was accepted and put into operation. Gen. Blaskowitz refused to surrender until the Ger. forces in N. Germany did so.

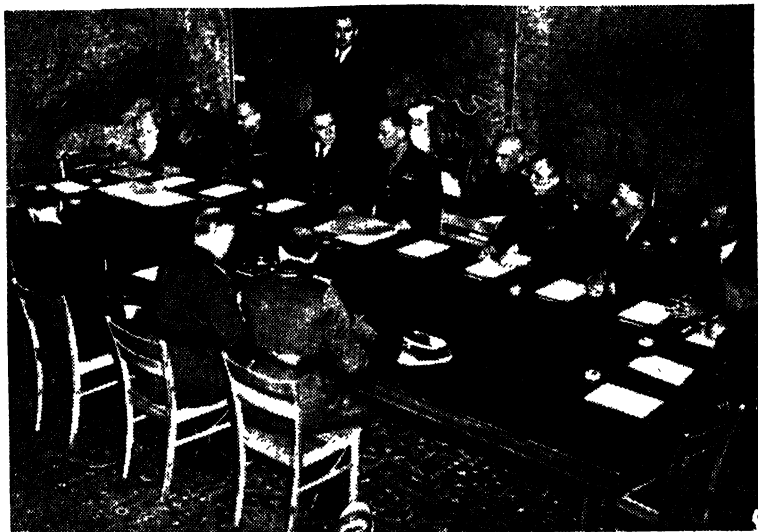
*Operations in the South.*—The Third Army from April 22, thrust down the Danube valley through crumbling resistance, crossing the riv. on the 25th (leaving Regensburg to be taken on the 26th), and advancing down the r. b. with 20th Corps and the 1. b. with 12th Corps. Passau was reached on May 2, and 11th Armoured Div. raced ahead to take Linz on May 5. The Czech frontier was crossed, and Pilsen fell on May 6. Amer. forces were halted on the line Budweis-Pilsen-Karlsbad, whilst the Red Army cleared the banks of the Moldau R. and occupied Prague.

Contact along the Ems valley was estab. as agreed.

20th Corps, S. of the Danube, crossed the Isar R. on April 29, and on May 1 reached the R. Inn at Braunau. To the right, 3rd Corps crossed the Danube near Ingolstadt on April 26, crossed the Isar on the 28th, and reached the Inn on May 2.

Nuremberg fell on April 25th, and two days later Seventh Army began its last offensive. 15th Corps took Munich on April 30. Berchtesgaden was occupied on May 4, other units took Salzburg, and

resistance in the Black Forest area broke, the Fr. moved on swiftly. Lake Constance was reached on April 22, and the corridor then widened. The advance turned N.E. to Ulm and on April 24 contact with the Seventh Army was made. Meanwhile the encircling process was completed by another Fr. advance up the E. bank of the Rhine to Basle, and then eastward. Stuttgart had been occupied on April 21. By the 26th, the Swiss border was reached from Basle to Lake Constance, and by the 27th organi-



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MAY 7, 1915 - THE GERMAN SURRENDER AT GENERAL EISENHOWER'S HEAD QUARTERS IN THE COLLÈGE MODERNE ET TECHNIQUE AT RHEIMS

Facing, left to right Gen Sir F. E. Morgan, Gen. Svez, Adm. Sir H. Burrough, Lt.-Gen. W. Bedell Smith, Maj.-Gen. Ivan Suslaparov, Gen. C. Spaatz, Air Marshal Sir J. M. Robb. Facing the Allied officers, Adm. H. von Friedeburg, Gen. A. Jodl, Maj. W. Oxenius.

from there to Linz Ger. resistance disintegrated. Meanwhile 21st and 6th Corps crossed the Danube near Dillingen on April 22, and at Donauehrth on the 24th. Enemy pockets were cleared, and Augsburg fell on April 28. To the W., 6th Corps reached Ulm and then drove on to the foothills of the Alps. Innsbruck fell on May 3, and units pressed on to the Brenner Pass, where, on May 4, contact was made with units of the Amer. Fifth Army driving into the Alps from Italy. No danger of a last stand in the Redoubt existed. On May 5, the Ger. Nineteenth Army surrendered, as did the whole of Army Group G the next day.

*Operations by the French Army.*—Simultaneously with Seventh Army's thrust into the Redoubt, the Fr. Army dealt with the Gers. farther W. After enemy

sed resistance ceased despite locally strong opposition Fr. armour, relieved at Ulm by Seventh Army, now advanced along the N. shore of Lake Constance and on April 30 turned S. into Austria. The advance went on up the Ill and Kloster valleys into the W. end of the Redoubt, where the Seventh Army was met as the Gers. capitulated.

By May 5, the war in Europe was virtually finished, and no Ger. army capable of fighting on existed. Contact with the Red Army was estab. from the Alps to the Baltic, and with the forces in Italy. The Redoubt was occupied, Norway isolated, and the Gers. in Holland and Denmark had just surrendered. The Channel Is., the ports of Brittany, and Dunkirk were powerless.

*The Surrender.*—In March 1945, the

Nazi Gov. tried, through Stockholm, to arrange a truce with the W. Allies in order to concentrate on the Russians, but immediate rejection was encountered. In the last week of April Himmler offered, through the Swedish Gov., to surrender all forces fighting on the W. F. Again it was repudiated that simultaneous, and unconditional surrender on both fronts was the only course open. Hitler and his entourage, with nothing to lose, maintained the hopeless fight, but individual commanders began to face the facts. All fighting in Italy ceased on May 2. Army Group G capitulated on May 6. The commanders in Norway and Denmark seemed ready to surrender in the last weeks of April, but on May 3, Doenitz, Hitler's successor, who had instructed the forces facing E. to turn around and surrender to the W. Allies, came into the picture. After attempting unsuccessfully to avoid surrendering to the Red Army, his emissaries on May 4 signed a capitulation, effective on May 5, for all Ger. armed forces in N.W. Germany, Holland, Schleswig-Holstein, and Denmark. Adm. von Friedeburg, representing Doenitz, arrived at Gen. Eisenhower's headquarters on the evening of May 5, and was told that unconditional surrender was the only course open to him. Jodl arrived on May 6, and it became clear that the Gers. were merely playing for time to evacuate as many soldiers and civilians as possible behind the Allied lines, and to cut this short Gen. Eisenhower threatened to seal off the W. F. against any westward movement of Gers. unless all hostilities on both fronts ceased within 48 hours. This was immediately effective and Doenitz approved acceptance of the terms. At 2.41 a.m. on the morning of May 7 Jodl signed 'he act of surrender on behalf of the Ger. High Command, the terms to become effective at midnight of May 8/9. Formal ratification was signed in Berlin on the night of May 9. In these discussions at Allied headquarters the Russians and the Fr. were associated with the Amers. and Brit.

See Gen. D. D. Eisenhower, *Report by the Supreme Commander to the Combined Chiefs of Staff on the Operations in Europe of the Allied Expeditionary Force, 6 June, 1944, to 8 May, 1945* (H.M.S.O.), 1946; Field-Marshal Viscount Montgomery of Alamein, *Normandy to the Baltic, 1947*; and the bibliography to WORLD WAR, SECOND.

**Western Union**, name given to a loose association of the nations of W. Europe for the defence of themselves and their way of life. Though a United States of Europe was the ultimate aim of many advocates, falling any such consummation they supported a United States of W. Europe and a W. Europe associated with the other W. countries of the world. Some also had in mind the economic advantages of unrestricted trade between the countries of the union, but recognised that unless a tolerable assurance against the danger of war could be secured, no economic plans could succeed. The Union, however, is not a federation;

there is no common Parliament, though there is a loose consultative assembly; nor is there a cabinet or gov., though there is a committee of ministers, both these bodies belonging to the council of Europe (see EUROPE (HISTORY), *Council of Europe*). W. U. is built on the foundation of a number of specialised institutions set up for limited, clearly defined, and urgent tasks. First of these is the Brussels Pact, a five-country defensive alliance (see BENELUX; BRUSSELS TREATY), with a permanent organisation at Fontainebleau. Next is the wider N. Atlantic Pact (see NORTH ATLANTIC TREATY), which in addition to the Benelux countries includes Britain, France, the U.S.A., Canada, Norway, Denmark, Iceland, Italy, and Portugal. In May 1949, was estab. a European Council with its two wings, already noticed, the committee of ministers and the consultative assembly of all-party members of parliaments. This latter is only a consultative body and is therefore unlike the conferences and meetings of the Inter-Parliamentary Union, an important but unofficial union. It is an official body of members of Parliament meeting with status and functions defined in an international treaty and is thus part of a great international official machine. On the economic side of the W. U. is the Organisation for European Economic Co-operation (*q.v.*) set up in Paris primarily for the purpose of distributing Marshall Aid. (See EUROPE (HISTORY), *European Recovery Programme*).

It is to be observed that the membership of these different institutions is varied and overlapping. The five Benelux or Brussels Pact countries' membership runs throughout, but apart from those five, each is in some and out of others. The different treaties and agreements which set up these constituent institutions of W.U., preserve national sovereignty at every stage. The whole of the new organisation of W.U. is not a form of real gov.; but only a machinery of organised regular and permanent diplomacy, consent being required at every stage. W.U., like the League of Nations or the United Nations, is a system of inter-state govts. based upon the retention and preservation of national sovereignty, and not a true super-gov. able by the authority of the people behind the govts. or the parliaments to override a particular country by any form of majority vote.

On the military side W.U. has a compact international defence organisation in the Brussels Treaty, which operates on the principles of a unified command, unified strategy, and a combined supply programme.

A mutual defence agreement between Britain and the U.S.A. under the N. Atlantic Treaty was signed in Washington on Jan. 27, 1950, and came into force at once. Similar agreements were signed between the U.S.A. and France, Italy, Denmark, Norway, Belgium, the Netherlands, and Luxembourg. See Barbara Ward, *The West at Bay*, 1948; and R. G. Hawtrey, *Western European Union* :

*Implications for the United Kingdom, 1949.*

**West Flanders**, most westerly prov. of Belgium, bounded on the E. by the Netherlands and E. Flanders, S. by Hainaut and France, W. by France, and N.W. by the North Sea for about 40 m. As in East Flanders the country is flat. The soil of the Polders is very productive and the plain of Flanders is well cultivated. Agriculture and cattle breeding are the chief occupations of the inhab. Flax, hops, and tobacco are grown. The people are also engaged in fishing, and in weaving, spinning, lace-making, bleaching, etc. In the narrow unfertile belt of sand dunes lie close to each other the famous seaside resorts of which Ostend and Knokke are the most important. Other important tns. are Bruges (the cap.), Ypres, and the industrial centres of Mouscron, Roeselare, Menin, Izegem, and Courtrai. Area 1249 sq. m. Pop. (1949) 996,400.

**West German Republic**, federal republic comprising the W. Ger. *Länder*, of the U.S., Brit., and Fr. zones of occupation (see GERMANY: *Allied zones of occupation*), with a combined pop. of about 45 million people. Its constitution, which is of the federal form and owes much to Brit. parl. precept and procedure, was approved on May 12, 1949, by the Amer., Brit., and Fr. military governors and ratified by a two-thirds majority of the constituent *Länder* soon afterwards, Bonn being chosen by the parl. council as the seat of gov. The republic came into existence on May 23, when the basic law or constitution was signed by members of the parl. council in the presence of the Allied deputy military governors (thereafter to be called commissioners). First elections to the Bundestag or Lower House of the W. Ger. Parliament were held on Aug. 15, the Christian Democrats emerging as the strongest party. The total number of deputies was 402, of which 242 were elected by direct vote and 160 by proportional representation. Ten parties, counting the Christian Democratic Union and the Christian Social Union as one, were represented. The result was a victory for the right over the left, more than 13 million votes being cast to the right of the Centre Party and 8 million to the left. Theodor Heuss was elected President of the republic (on the second ballot), by 416 votes against 312 for Schumacher. Dr. Konrad Adenauer, leader of the C.D.U., was elected federal chancellor (16 Sep.). The first gov. of the republic was a right-wing coalition of 3 parties: the C.D.U., with its Bavarian wing, the Christian Social Union; the Free Democrats or 'liberals'; and the right-wing Ger. Party. The Adenauer Gov. professed a belief in free enterprise and unrestricted capitalism. In the declaration of policy of his gov. (Sept. 20), Adenauer voiced the determination of his ministers to co-operate closely with the W. powers.

In retaliation for the institution of the W.G.R., an E. Ger. State or 'German Democratic Republic' was estab. under Russian auspices in the E. zone of Germany: it was announced on Oct. 10,

that the Russian military administration would be superseded by a control commission and its administrative powers assigned to the E. Ger. Gov. In their Note of Oct. 1, protesting against the formation of the W.G.R., the Soviet Gov. alleged that the Brit. Gov. had violated the Potsdam agreement (see KUROFF (HISTORY), *Reconstruction measures*) as well as the decisions of the council of foreign ministers at Paris and must assume responsibility for splitting Germany and delaying the conclusion of a peace treaty. In reply the Brit. Gov. pointed out that it was only when the Soviet Gov. refused to treat Germany as a unit in accordance with the decisions of the Potsdam conference that the Brit. Gov. was compelled, in conjunction with the govts. of the United States and France, to unify Germany in so far as it lay within their power, and to take progressive steps towards the unification of their respective zones. The W. G. R. (and the Saar) were admitted as associate members of the consultative assembly of the Council of Europe at its second ann. session (1950). In Sept. 1950 Britain, France, and the U.S.A. announced steps which foreshadowed the early end of the state of war with Germany, which had existed since 1939; and stated that the W. G. R. could now enter into diplomatic relations with foreign countries 'in all suitable cases.'

**West Ham**, parl. and co. bor. of Essex, England, and an E. suburb of London, adjoining E. Ham. There are sev. manufs., and many workers are employed at the docks and the Stratford railway shops. During the Second World War, W. H. was very heavily bombed. The pop. before the war was 270,000. The redevelopment scheme is based on an maximum pop. of 165,000.

**West Hartlepool**, modern tn. built round the old vil. of Stranton, a co. bor. of Durham, England, on the N.E. coast some 4 m. N. of the mouth of the Tees. The charter of incorporation was obtained in 1887. The main heavy industries are steel manufs., shipbuilding, and engineering, but, since the Second World War, new light industries have been developed. The tn. has its own seaside resort at Seaton Carew, which is within the co. bor. Pop. 70,000.

**West Haven**, tn. of New Haven co., Connecticut, U.S.A., separated from New Haven by the West R. It manufs. tools, motor-boats, and musical instruments. Pop. 30,000.

**West Highlander Breed**, see CAULE

**West Highland White Terrier**, breed of dog probably descended from the Cairn Terrier (*q.v.*), but existing as a separate breed for nearly a century, and known as the Poltalloch Terrier when first exhibited. Dogs weigh from fourteen to eighteen lb. and bitches about two lb. less; its height is from eight to twelve in. at the shoulder.

**Westhoughton**, tn. in Lancashire, England, situated between Bolton and Wigan, 5 m. from each. The chief industry is cotton manuf. Pop. (estimated) 15,000.

**West Indies**, archipelago extending in a curved chain from the Florida Channel (N. America) to within 7 m. of the coast of Venezuela (S. America), i.e. between 27° and 10° N. lat., and varying in size from 44,206 sq. m., the area of Cuba, to a few ac. They and their waters represent the Sp. Main of hist. and romance and, with the N. coasts of Central and S. America, enclose the Caribbean Sea, lying across the trade routes to the Panama Canal. The is. were called the W.I. because Christopher Columbus, who discovered them, believed when he cruised round Hispaniola (Haiti and Santo Domingo) that he had reached India by a W. route. The alternative name is the Antilles. The total land area is nearly 100,000 sq. m., of which 73,742 sq. m. are independent, 12,300 Brit., 3556 Amer., 986 Fr., 403 Dutch, and 90 Venezuelan. (This area excludes Brit. Guiana, Brit. Honduras, Curaçao, and Surinam, which, having much in common with the W.I., are occasionally mentioned in this article.) The archipelago may be divided into three groups: (1) The Greater Antilles, consisting of Cuba, Haiti, and Santo Domingo, or the Dominican Republic, all independent; Jamaica, and its dependencies (Turks, and Caicos Is., and the Caymans, Brit.; and Puerto Rico, U.S.A.; (2) The Bahamas, Brit.; and (3) The Lesser Antilles, the semicircle of smaller is. to the E. of the Greater Antilles.

The Lesser Antilles are divided among Great Britain, France, the Netherlands, the U.S.A., and Venezuela. In 1917 the U.S.A. bought the Virgin Is., formerly the Dan. W.I., from Denmark, the total area that changed hands being 132 sq. m. The Sp. called the Lesser Antilles, which are exposed to the prevailing N.E. winds, the Windward Is. (*Islas de Barvento*), and the Greater Antilles, the Leeward Islands (*Islas de Sotavento*) from their more sheltered position; but these terms are now applied exclusively to two entirely different groups of Brit. Is. The Windwards include Grenada, St. Vincent, the Grenadines, St. Lucia, and Dominica, forming the E. barrier to the Caribbean Sea between Martinique and Trinidad. The Leewards include Antigua (with Barbuda and Redonda), St. Kitts-Nevis (with Anguilla and Sombbrero), Montserrat, and the Virgin Is. (the largest being Virgin Gorda). The Amer. Virgin Is. comprise St. Thomas, St. Croix, St. John, and some neighbouring islets. The Fr. is. are Guadeloupe, with its dependencies Marie Galante, Les Saintes, Désirade, St. Barthélemy and St. Martin and Martinique, Curaçao and its dependencies, Aruba, Bonaire, and other is. are Dutch; and Margarita is Venezuelan.

**Geology, relief, and hydrography.**—Most of the W.I. are of volcanic origin, though some, especially the Bahamas, are of coral formation. Many of the almost land-locked harbours, such as Castries, are craters of extinct volcanoes. The W.I. are really the peaks of a submerged range of mts. known as the Caribbean Andes and which in the Tertiary period

formed a link between N. and S. America. There is practically no running water in the W.I., though there are ample underground supplies. In the W. of Cuba are the Sierra de los Organos, reaching a height of over 2500 ft., and at the extreme E. end of the is. is a range of mts. facing S., the Sierra Maestra (4000 ft. mean altitude); but the is. is divided into two parts by a large marshy depression 47 m. wide, between the N. and S. coast. In consequence of Cuba being largely composed of limestone the drainage is partly underground, and many rivs. are lost in swamps. Hispaniola (Santo Domingo and Haiti) is generally mountainous, the highest summit exceeding 10,000 ft. Puerto Rico is an elevated plateau with a large number of rivs. In Jamaica the Blue Mts. exceed 7000 ft., but in the centre and W. is a limestone plateau with deep valleys with self-contained drainage. S. of Puerto Rico the is. form a deeply submerged mt. ridge separating the Caribbean Sea from the Atlantic Ocean.

**Climate.**—The climate of the W.I., generally speaking, is healthy for Europeans, especially during the winter in the season of the N.E. trade winds. The is. are subject to occasional hurricanes from Aug. to Oct.

**Ethnology and Religion.**—The races inhabiting the W.I. when Columbus reached them were Arawak and Carib Indians. The Arawaks of the large is. were soon exterminated, chiefly by the Sp. There are still families of almost pure-blooded Caribs in Dominica and in St. Vincent. Negroes have increased since their emancipation, and quite two-fifths of the total pop. are now Negroes and mulattoes. There has been also a considerable influx of labour from India and China to work in the plantations. In Cuba and Puerto Rico whites are in the majority, but they are largely outnumbered in the other is., and in Haiti practically the whole pop. is Negro.

The Negroes are generally nominally Protestant, but in Cuba and Puerto Rico the religion is Rom. Catholic, the people being of Sp. descent. The Brit. colonies, except those taken from Spain or France, are mostly Protestant.

The hist. of the Brit. and other colonies in the separate articles on the different is., indicates the origin and progress of the white pop. of the W.I.

**Slavery and the Slave Trade.**—Sir John Hawkins began slave trading in 1562, and Sir Francis Drake followed in 1568. At the end of the sixteenth century the Dutch entered the trade and in 1662 and 1672 Eng. 'African Companies' were formed to carry on the trade. At the end of the next century some 25,000 Negroes were shipped annually to the Eng. colonies. In 1807 an Act was passed in the Commons for the abolition of the trade and in 1834 slavery was abolished. Slavery was finally abolished in the Fr. W.I. in 1848; in the Dutch W.I. in 1863; and in Puerto Rico in 1873. Slaves were gradually manumitted in Cuba under an Act of 1879, total abolition being decreed in 1886.

**Production.**—The flora of the W.I. is of



great variety and richness. The sugar cane and tobacco plant are extensively grown, and among other crops are beans, peas, rice, maize, and Guinea corn. Forests are numerous and wide-spreading, and produce valuable woods and abundant fruits. Palms are in great variety, and there are sev. species of gum-producing trees. Where possible, cattle-breeding is practised. Goats and large flocks of sheep are kept. Trinidad boasts a famous natural phenomenon, a pitch lake which provides asphalt for export, recent ann. production being about 85,000 tons. Trinidad also produces petroleum.

of a comptroller, with a staff of experts, who is responsible only to the secretary of state for the colonies and who has wide discretion in the expenditure of monies on schemes approved by the secretary of state. The problems of the is. colonies spring from their over-populated condition, their overgreat dependence upon sugar, the one crop that can be guaranteed to thrive and to employ large numbers, and the lack of other resources and consequently of money. The Colonial Development Corporation (*see under* COLONIAL DEVELOPMENT AND WELFARE) has surveyed many agric. and industrial



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## TRINIDAD : WORKERS AT THE PITCH

*The Cane-Sugar Industry.*—The total production of cane-sugar in the W.I. in the year 1946-47 was 7,573,000 tons, total world production being 18,827,000 tons. The extension of the beet-sugar industry has caused a slump in the cane-sugar industry but various factors have combined to improve the position in the Brit. W.I.

*West Indian Development.*—The West India Development Fund was created on the recommendation of the West India Royal Commission, appointed in 1938 to enquire into all aspects of life in the Brit. W.I. Conformably with its recommendations (which were accepted during the war in 1941 though pub. of the full report was postponed to June 1945) this Fund was estab. for the purpose of financing schemes for the general improvement of social conditions, which were severely criticised in the Report. The Fund is financed by an ann. grant of £1,000,000 from the Imperial Exchequer, which sum is assured for a period of not less than 20 years. The administration of the Fund is in the hands

projects for the W.I. The Evans Commission also pointed to a possible solution in reporting that the mainland colonies should be capable of absorbing 100,000 people over a ten-year period. (For the pop. of the various is., *see under* JAMAICA, CUBA, etc.)

*West Indian Federation.*—A conference at Montego Bay in 1947 recommended that a federal constitution for the W. I. should take as its model that of Australia. Steps towards federation and unification of the public services in the same area are outlined in two reports (H.M.S.O., 10 March, 1950), issued respectively by the Brit. Caribbean Standing Closer Association Committee and another committee on the unification of public services, the appointment of both committees being the sequel to the conference. The first of these committees recommends federation as 'the shortest path towards a real political independence for the Brit. peoples of the region' and suggests a grouping which would comprise Barbados, Brit. Guiana, Brit. Honduras, Jamaica,

Antigua, St. Kitts-Nevis, Montserrat, Trinidad and Tobago, Grenada, St. Vincent, St. Lucia, and Dominica, with Trinidad as the cap. It suggests a federal legislature composed of a governor-general, a senate, and a house of assembly, making a div. of powers on lines rather similar to the general pattern of the Australian constitution. The federation, as planned, would precede the attainment of full dominion status (*q.v.*) and in the intermediate phase the powers of the federal gov. would be limited not only by the rights of the units, but by those reserved to the governor-general acting on instructions from the gov. of the United Kingdom. The committee argues that the combination of the is. into a larger economic unit will help them to attain collective self-sufficiency, and that federation is a powerful instrument for promoting economic combination. *See also* articles on separate is.

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**West Indies Regiment, The British.** The regiment was formed in 1779 from Loyalist settlers who flocked to join the Brit. expedition against Savannah, Georgia. These settlers formed the South Carolina Regiment, and the association with South Carolina is commemorated by the crossed wreaths of laurel and Carolina laurel borne on the appointments. After the Amer. Revolution, the regiment was removed to Jamaica. In 1782 it had white and black troops. Recruits were obtained from the Negro slaves shipped from W. Africa and were known as King's Men. After the abolition of slavery in 1811 W. Africans were still engaged and the regiment permanently maintained two recruiting companies in Sierra Leone and Gambia but from about 1880 onwards all recruiting was from the W. Indies. The officers were always Eng. as were most N.C.O.s, who were posted to senior ranks from Brit. regiments of the line. In 1803 the regiment, now known as the 1st West India, took part in the defence of Dominica, and, in 1809, in the conquest of Martinique and Guadeloupe. In the nineteenth century the regiments saw service in Central and S. America, and in the

Ashanti Wars. In the Gambia campaign of 1892, two V.C.s. were won, both by W. Indians.

In the First World War eleven battalions served: the first was the Indian contingent which arrived in Britain in 1915. By 1916 other contingents had followed and three battalions had been formed. The 1st and 2nd were sent to Egypt, followed by the 3rd and 4th. In the same year the 3rd and 4th were ordered to France as ammunition carriers and successive battalions did service either as ammunition carriers or labour battalions in France. The 1st and 2nd Battalions saw fighting in Palestine and a unit of 500 men took part in the East African campaigns. In 1944 a contingent of 1000 men from all the West Indies and Bermuda was formed and sent to America to complete its training. It was the first Brit. unit to set foot in America since the war of Independence. In July 1944 it sailed for Italy but did not go into action before the collapse of Germany in 1945.

**West Kazakhstan, Region of the Kazakh S.S.R.**, extending to the W. and N.W. frontiers of the republic.

**West Kent Regiment, Queen's Own Royal.** The first battalion of this regiment is the descendant of a 32nd Regiment of foot, raised in 1755. A year later the old 50th and 51st Regiments were disbanded and the 52nd was renumbered 50th. The title 'West Kent' was adopted in 1782. The 50th became Queen's (Adelaide's) Own in 1821, having served in Egypt, the Peninsula, and in India. It formed part of Sir John Moore's columns on the retreat to Corunna. The 2nd battalion of the Royal W. Kents was originally the 97th Foot, raised in 1824, which fought in the Crimea and in the Indian Mutiny. Since the amalgamation of the 50th and 97th in 1881 the regiment has served in the Egyptian and Sudanese campaigns of the eighties, in S. Africa and in both World Wars. Eighteen battalions were raised in 1914-18, and eleven of them served in France, Italy, Gallipoli, Palestine, and Mesopotamia.

In the Second World War both regular and Territorial battalions served in France up to June 1940, the fourth battalion was at the taking of Kohima in Burma, and others fought in the Mediterranean.

**West Kirby**, holiday resort of Cheshire, England, at the mouth of the Dee in the Wirral Peninsula, 8 m. from Birkenhead. It has a large marine lake and sporting facilities. It is part of the urb. dist. of Hoylake (pop. 31,200). Pop. 17,000.

**Westland**, prov. dist. of South Is., New Zealand, lying between the S. Alps and the Pacific Ocean, and between Grey R. in the N. and Big Bay in the S. There are gold deposits and coal; sawmilling, dairying, and cattle rearing are carried on. The chief tns. are Greymouth and Hokitika. Area 4880 sq. m. Pop. 18,000.

**West Lothian**, co. of Scotland, once called Linlithgowshire, with Lanarkshire and Stirlingshire to the W. and Midlothian to the E. There are 17 m. of coastline on the Firth of Forth. The interior is hilly.

with heights of 1000 ft., and there is a low coastal belt. The Avon and the Almond are the only rivs., and Linlithgow Loch the only lake. The co. tn. is Linlithgow, other tns. being Bathgate, Broxburn, S. Queensferry, and Bo'ness. Oats is the chief agric. crop; barley, grasses, and wheat are also grown, and dairy-farming is carried on. Coal and iron ore are mined, and the shale-oil (*q.v.*) industry is one of the largest in Europe. Area 120 sq. m. Pop. 82,400.

**West Lulworth, and East Lulworth**, two vills. of S. Dorset, England. W. L. is 8 m. from Wareham, and nearby in the par. is Lulworth Cove, a famous beauty spot and bay about 500 yds. across almost enclosed by hills. E. Lulworth Cove, with the Purbeck Hills and woodlands make one of the most famous beauty spots in the country, but the heath to the E. has greatly suffered from use as a tank gunnery range. A coastline of about 5 m. to the E. of the Cove is closed and tank gunnery ranges extend about 4 m. inland, covering about 8500 ac., including sev. vills. Near Lulworth Castle (destroyed by fire in 1929) at E. L. stands the Catholic chapel, built in 1786, and the first to be erected openly as such in England since the Reformation (apart from those attached to foreign embassies, etc.).

**West Malling**, see MALLING.

**Westmeath**, inland co. of Leinster, Ire, bounded N. by Cavan, S. by King's co., E. by Meath, and W. by Roscommon. The surface is varied and is some 250 ft. above sea-level. It contains some very fine scenery and is a co. of loughs, the largest being Lough Ree on the Shannon; others include Lough Sheelin and Lough Kinale. The loughs are famous for their trout fishing. The prin. rivs. are the Shannon, the Inny, and the Boyne. The Royal Canal cuts through the co., affording easy communication with Dublin. Agriculture is the staple industry and dairy farming is largely carried on. Some friezes and coarse woollen materials are manufactured. The chief tns. are Athlone and Mullingar, the co. tn. With Meath, of which W. was a part until 1543, the co. returns four members to the Dail. The co. contains a number of interesting auct. monuments; the ruins of Multi-farnham Abbey (1236) with its lofty towers are noteworthy. The area of the co. is 680 sq. m. Pop. 54,880.

**Westmeath, Earl of**, see NUGENT, SIR RICHARD.

**Westminster Abbey**. The beginnings of the Abbey church of Westminster are obscure. Its legendary hist. dates back to its foundation in 616, when the first church is said to have been built by King Sebert. The official title of the abbey today is the Collegiate Church of St. Peter, Westminster. There was a Benedictine monastery on the site in the eighth century. Edward the Confessor built an immense church, and much of Edward's monastic buildings survive together with fragments of his church. The church was consecrated in 1065. The style was that of the new and advanced schools of Romanesque architecture which had

developed in Normandy and Touraine. For many years Edward the Confessor's church met all requirements but by the early thirteenth century the old Norman sanctuary had become cramped and inconvenient. The demolition of Edward's church began in 1245 and by 1258 the new E. sanctuary was completed. In 1258 the demolition of the Norman nave was begun and in 1269 the body of St. Edward was placed into a splendid gold shrine which stood on the present marble mosaic base. The translation of the shrine took place on Oct. 13, 1269. The original design of the E. part was by Master Henry de Reyns who was succeeded by John of Gloucester, who did little. The third master mason, Robert of Beverley, finished these parts. The nave followed this design in general form but was changed in much of the detail by the great craftsman Henry Yevele.

**Design and architecture.**—The general plan of Henry III.'s church is very complex and unsuited for modern congregational worship; but it was designed to meet the diverse needs of many, the monks, the king and his court whose royal chapel it was, the pilgrims to the altars and shrines, and lay folk at prayers in the nave. The church is very large, long, and high. The extreme length of the Abbey is 530 ft. 9 in. The extreme breadth is 220 ft., the length of the nave is 154 ft., and its height 105 ft. The height of the towers is 225 ft. The piers are of Purbeck marble. The triforium is one of the most impressive of all the constituent portions of an early Gothic church in England, and the vaulting of the nave is particularly fine. Structurally, Henry III.'s is a Fr. church, but much of the detail is Eng.

The E. bays of the choir were probably a little later than Henry III.'s time and the nave took more than two centuries to complete. In 1928 a great fire destroyed all the monastic buildings. The whole of the damage was not made good until the time of Abbot Nicholas Litlington (1362-86), who completed the reconstruction of the monastic buildings. The nave was not finally completed until about 1528 under Abbot Islip, though work on it had been recommenced late in the fourteenth century, and the towers until about 1740. These latter were the work of Wren and Hawksmoor c. 1722-40.

The building of the last of the great works of W. A., Henry VII.'s Chapel which replaced the Lady Chapel of 1220, was begun in 1502. This great artistic achievement is the work of Robert Vertue. The fan vault is technically remarkable from the fact that the architect discarded the use of ribs, the unribbed vault being fitted together with as much precision and accuracy as the parts of a mosaic. Everywhere, with the sole exception of the external plinth, the chapel is crowded with ornament.

Other interesting medieval chapels are the Lady Margaret chapel and Queen Elizabeth's chapel in the S. and N. aisles of Henry VII.'s chapel; the apsidal chapels of St. Benedict, St. Edmund, St.

Nicholas, St. Paul, and St. John the Baptist; the Jerusalem chapel, and the Jesus chapel built by Abbot Islip. At the S. end of the S. transept is the very interesting chapel of St. Faith. In the S. transept there are two interesting wall paintings, recently discovered. W. A. is the scene of the coronation of the Eng. kings and the burial place of numerous kings, and of a host of soldiers, statesmen, and writers. In the centre of the nave is the tomb of an 'Unknown Warrior' of the First World War. Airmen of the Battle



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#### WESTMINSTER ABBEY

The West Front, showing the eighteenth century towers.

of Britain are commemorated by a memorial in the apse bay of Henry VII.'s Chapel. From a very early date the E. corner of the S. transept has been called Poets' Corner; the earliest represented is Chaucer, and amongst the last is Thomas Hardy.

The Chapter-house was built between 1250-53 and is one of the largest in England. From the reign of Edward I. until 1547 the House of Commons met here. It was completely restored by Sir Gilbert Scott in 1865, its beauty having been largely impaired by use as a Record Office. Its tile pavement dates back to 1250. The mural paintings have been skilfully restored. S. of the Chapter-

house is the chapel of the Pyx, a vaulted chamber built in c. 1045 and also under the jurisdiction of the Crown. The king's treasure chamber was once the crypt under the Chapter-house. On the left is the dark cloister, from which a doorway leads to the Norman undercroft of the dormitory. W. A. suffered some damage during the Second World War.

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**Westminster Assembly of Divines.** Puritan assembly, which sat at Westminster from Aug. 1643 to Feb. 1649. It formulated a Presbyterian system of church gov. in England, but all its work was swept away at the Restoration.

**Westminster Bank**, one of the leading five banks of the United Kingdom, estab. originally, in 1834, as the London and Westminster Bank and amalgamated with the London and County Banking Company (estab. in 1836) in 1909 under the name of the London County and Westminster Bank. It acquired Parr's Bank (estab. 1865) in 1918, the Nottingham and Nottinghamshire Banking Company in 1919, Beckett and Company, of Leeds and York, in 1921, and later the Guernsey Commercial Banking Company. Stillwell and Sons, besides a large share of the capital of the Bank of Brit. W. Africa. Affiliated banks are the Westminster Foreign Bank and the Ulster Bank. The authorised share capital of the W. B. is £33,000,000; subscribed, £30,533,127; paid-up, £9,320,157. Its reserve at Dec. 1949, was £9,320,157, and current deposit and other accounts £815,000,000. See also BANKS AND BANKING.

**Westminster Bridge.** The old W. B., by Labelle, was built in the middle of the eighteenth century, being opened for passengers in 1750 when London Bridge therefore ceased to be the only means of crossing the Thames at London. The present W. B., which is the property of the L.C.C., was opened in 1860-62.

**Westminster Cathedral, Eng.** Rom. Catholic metropolitan church, in London. The site, part of what was once known as Tothill Fields, was acquired by Cardinal Manning; his successor, Herbert Vaughan, carried through the building of the cathedral, and decided its architectural style, the early Christian Byzantine. The foundation stone was laid in 1895, and the fabric completed in 1903. The cathedral is 360 ft. long and 156 ft. wide, and covers 54,000 sq. ft., the height of the

campanile is 284 ft. and of the nave, 117 ft. The latter, with a width of 60 ft. and a length of some 200 ft. is the largest in England. It is planned to cover the upper half of the walls with coloured mosaic and to place symbolic groups in the circles of the domes. The Stations of the Cross were carved by Eric Gill.

There are eleven chapels. Separated from the nave by the S. aisle, from W. to E. are those of SS Gregory and Augustine, St. Patrick and the saints of Ireland, St. Andrew and the saints of Scotland and St. Paul. Beyond the transept is the Lady Chapel. On the N. side of the cathedral, from W. to E., are the chapels of the Holy Souls, St. George and the martyrs of England, St. Joseph, and beyond the transept the chapels of St. Thomas of Canterbury (the Vaughan Chantry), of the Blessed Sacrament, and of the Sacred Heart of Jesus, and St. Michael the Archangel. The decoration (in which coloured marbles and mosaic work are prominent) in many of the chapels remains to be completed. In a group attached to the cathedral are the Archbishop's House, the Clergy House, and the Choir School House, connected by a common library and cloister.

**Westminster, City of**, largest of the twenty-eight bors. of the co. of London, is also, perhaps, the most important, for it contains the royal residence, the houses of the legislature, the supreme courts of law, the chief public offices of the executive gov., and the magnificent abbey church of St. Peter, in which some of the greatest of Englishmen have been interred. (See WESTMINSTER ABBEY.) W. and the City of London jointly return one member to Parliament. The city has an area of 2503 ac. Pop. 82,800.

**Westminster College**, founded in 1851. Methodist residential College in London for training of men teachers. A constituent College of the Univ. of London Institute of Education, it provides (two-year courses for teacher's certificate, four-year courses for degree and teacher's certificate, and one-year supplementary courses in religious education.

**Westminster, Dukes of**. The first to hold this title was Hugh Lupus Grosvenor (1825-99), who was created duke of W. in 1874. He was the grandson of Robert Grosvenor, 2nd Earl Grosvenor (1767-1845), upon whom the title of marquess of Westminster was bestowed in 1831.

**'Westminster Gazette'**, former London Liberal evening daily paper, estab. in 1892 by George Newnes (*q.v.*) and remarkable for being printed on pale green paper. An outstanding feature was the strong front-page article on the political issue of the day; amalgamated in 1928 with *The Daily News*.

**Westminster Hall**, banqueting room, ceremonial hall and, formerly, also a law court, situated in the sunken garden on the W. side of the Houses of Parliament or Palace of Westminster with which it is incorporated. It was originally erected by Wm. Rufus between 1097-99 as a banqueting room to the palace built by Edward the Confessor. It was first

divided by a double line of columns. The hall was remodelled and heightened by Richard II., who rebuilt the N. end, removed the columns, and put up the oak roof, Chaucer being clerk of the works. The hammer-beam roof is a fine example of Gothic open timber work. The roof was again repaired in 1819, and between 1914-23. W. H. is one of the largest halls in Europe that is entirely supported by pillars. Notable trials that have taken place here are those of Wm. Wallace in 1305; Sir Thomas More, 1535; Guy Fawkes, 1606; Charles I., 1649; the Seven Bishops, 1687; and the Scottish Lords after the Young Pretender's rising. The hall was also used for great state ceremonies (*e.g.* here Richard II. was deposed), and coronation feasts from the reign of Stephen to that of George IV. The Courts of Justice were at W. H. until 1882.

**Westminster, Palace of**, see under PARLIAMENT, HOUSES OF; WESTMINSTER HALL.

**Westminster School**, public school for boys in Westminster, England. Early fourteenth century writers describe it as a Grammar School attached to the Benedictine Abbey of St. Peter, Westminster. Queen Elizabeth refounded it in 1561. The Abbey remains the school chapel but the legal connection of Abbey and School was severed by the Public Schools' Act, 1868. W. S. is built round Little Dean's Court and was damaged by Ger. bombs in 1941. Most of the pupils are boarders, but there are some day boys. There are about 350 pupils. There is a governing body of fifteen. There are numerous entrance scholarships, including forty on Queen Elizabeth's foundation. The recipients of these are called King's Scholars.

**Westminster, Statute of** (1931). Brit Act of Parliament which estab. the relation of Britain and the dominions as defined at the Imperial Conference in 1926. It repealed certain provisions of the Colonial Laws Validity Act, 1865, thereby abolishing the power of Parliament to legislate for the dominions and to veto dominion Acts; and it acknowledged the right of the dominion parliaments to amend or repeal any Act of the Brit. Parliament applying to them. The S. of W. also recognises the essential link between the members of the commonwealth in the crown. (See also COLONIAL LAW. For earlier Ss. of W. see DE DONIS CONDITIONALIBUS and QUIA EMPTORES.)

**Westminster Theatre**, in Palace St., London, S.W.1., was opened in Oct. 1931. Amner Hall was its first manager. It was at one time noted for its production of experimental works, and was also under the control of the Oxford Group for a short period. The seating capacity is 680. Productions include, *Tobias and the Angel* (1932), *Mourning Becomes Electra* (1937), and *Black Chiffon* (1949).

**Westmorland**, northern co. of England, bounded on the N.W. by Cumberland, S. and W. by Lancashire, and E. by Yorkshire. W. comprises a considerable part of what is known as the fell country and also of the Lake Dist. (*q.v.*). The moun-

tainous region, with its great tracts of moorland, affords some magnificent scenery and includes the heights of Crossfell (2930 ft.); though the actual peak lies in Cumberland), Milbourn Forest (2780 ft.), Helvellyn (3118 ft.), and many others; while the lakes include Windermere (in part), Ullswater (in part), Grasmere, and Hawes Water. The prin. rvs. are the Eden, running through what is known as the Vale of Eden, the Lune, and the Kent. Throughout the Lake Dist. there are crags and scars and also a number of beautiful waterfalls. The climate is for the most part wet, the E. of W. being rather cold, and only about half of the co. is under cultivation, and of this the greater part is devoted to pasturage, sheep and cattle being raised in large numbers. Oats is the main crop. Lead, slate, graphite, and marble are produced. The manufs. include woollen goods, paper, and bobbin making. The prin. tns. are Appleby, the co. tn., and Kendal; the co. returns one member to parliament. There are anct. castles at Appleby, Brough, and other places, and the ruins of Shap Abbey. W. suffered from the invasions of the Scots in anct. times, Appleby being twice sacked and burnt. During the Civil war the co. was royalist. Many of its gentry later espoused the Jacobite cause, though the masses took little interest in the rebellion of 1745. Sev. writers are associated with W., including Wordsworth, Hartley Coleridge, De Quincey, Harriet Martineau, and Beatrix Potter. Romney served as an apprentice at Kendal. The area is 790 sq. m. Pop. 75,200. See H. D. Rawnsley, *Literary Associations of the English Lakes*, 1894; H. Collingwood, *The Lake Counties*, 1932, 1949; Sir C. Jones, *A Tour in Westmorland*, 1919; N. Nicholson, *Cumberland and Westmorland*, 1949.

**West New York**, tn. in Hudson co., New Jersey, U.S.A., connected by ferry with New York. Its chief manufs. are silk, sugar, cotton-seed oil, and rubber. Pop. 39,100.

**Weston-super-Mare**, seaside resort, spa, and co. bor. of Somerset, England, 16 m. from Bristol, on the Bristol Channel. Until the middle of the nineteenth century it was a tiny fishing hamlet, but recognition of the invigorating qualities of its air has made it the largest resort of its kind between Land's End and Lancashire. W. caters for every taste in amusement. Amenities include golf-links, tennis and badminton courts, the Grand Pier, with an amusement pavilion, a number of public parks and gardens, and a large swimming-pool on the sea-front, which can accommodate 1500 bathers. Pop. 39,800.

**West Orange**, tn. of Essex co., New Jersey, U.S.A., adjoining Orange co., and 13 m. W. of New York City. It was chartered as a tn. in 1909. The Edison plant produces electrical accessories; cement is also made. Pop. 25,700.

**Westphalia**, former prov. of Prussia, constituted in 1815, but now part of the Land North Rhine-Westphalia, in the

Brit. zone of occupation in Germany. The Land of North Rhine-Westphalia includes the former prov. of W., the government dists. of Cologne, Aachen, and Düsseldorf, and the former Land Lippe. The prov. had an area of 7801 sq. m.; the present Land has an area of 13,127 sq. m. The prov. was divided into 3 administrative divs., Munster, Minden, and Arnsberg, and had Munster for its cap. (heavily damaged in the Second World War). The cap. of the Land is Düsseldorf. The Land is bounded on the N. by Hannover, on the E. by Hessen, and on the S. and W. by the Rhineland-Palatinate. The S. of the old prov. is mountainous, being diversified by the Schiefergebirge and the hills of Sauerland, and farther N. are the Eggegebirge and part of the Teutoburger Wald, on each side of which lie portions of the plain of N. Germany. On the N.W. is the 'bay' of Munster, and on the N.E. the valleys of the Weser and the Werre. Other rvs. are the Ems, Lippe, Ruhr, Sieg, Eder, and Vechte. The climate is temperate except in the S., which is cold in winter and has a heavy rainfall. Flax is grown, in addition to grain of all kinds, fruit, hemp, potatoes, peas, and beans. The breeding of horses is also carried on and the rearing of cattle and goats. But the wealth of W. lies in its minerals, of which the chief are coal and iron; the former being found in the great Ruhr coalfield, which extends from the Rhineland into the old prov. as far as Unna, the centre being Dortmund, and there is a smaller coalfield in the N. at Ibbenburen, the latter occurring in the Schiefergebirge and the Ruhr coalfield. Besides these, zinc, lead, copper, antimony, quicksilver, stone, marble, slate, and potter's clay are also found, and there are brine springs in the Hellweg, and mineral springs at Schwelm, Lippstadt, Oeynhausen, and Driburg. Manufs. before the Second World War included notably iron and steel, brass and bronze, tin and Britannia metal, needles, linen, jute, paper, leather, and cotton goods. Other manufs. are chemicals, glass, sugar, sausages, hams, and cigars. Many of the tns. were extensively damaged by Allied bombing during the Second World War. The prov. was constituted in 1815. Pop. of North Rhine-Westphalia (1946), 11,810,000.

**Westphalia, Treaty of**, peace treaty signed at Munster Oct. 21, 1648, ending the Thirty Years' war (q.v.). By its articles France was confirmed in her possession of Metz, Toul, and Verdun, and also obtained the sovereignty of Alsace; Sweden was given Western Pomerania, Bremen, and Verden; and Bavaria, Brandenburg, and Saxony also received accessions of ter. A federation of some 300 independent states replaced the former empire. The independence of Switzerland and the United Provs. of Dutch Netherlands was recognised. Religious toleration was granted to Calvinists as well as Lutherans in Germany, but the principle was not estab. in the Hapsburg ters. The treaty marks the failure of the Austro-Sp. attempt to restore Rom.

Catholicism in Central Europe, and the beginning of Fr. hegemony in Europe. *See also HOLLAND, History.*

**West Point Military Academy.** The U.S. Military Academy is situated at West Point, on the r. b. of the Hudson R., in Orange co., New York, about 50 m. N. of New York city. With one or two exceptions the theoretical and practical instruction of the strength of 2496 cadets is carried on by commissioned officers, aided by detachments of enlisted men from the sev. arms and services. Cadets are appointed between the ages of seventeen and twenty-two years (or nineteen and twenty-two years if selected from the army or the National Guard); and the course of study is four years; and upon graduation cadets may be commissioned as second-lieutenants in the Regular Army.

**Westport:** 1. Urban dist., mrkt. tn., and seaport of Clew Bay, co. Mayo, Ire, 12 m. S.W. of Castlebar, connected by steamer with Glasgow and Liverpool. Clothing, mineral waters, boots and shoes, cotton thread, shirts, furniture, leather goods are manufactured. W. is a railhead and Western depot for the C.I.G. railway system. Pop. 4500. 2. Bor. in Nelson Prov., S. Is., New Zealand, at the mouth of Buller R. Over three-quarters of a million pounds have been spent on the harbour works designed by Sir John Coode. W. is the place of shipment for the coalfields in the neighbourhood. To the S. are the alluvial gold-mining centres of Addison's Flat, Cronville, Nine-Mile Beach, and Charleston, the latter now producing much lignite coal. open-cast methods being used. Pop. 4930.

**West Prussia,** former prov. of Prussia, situated in the N.E. of the old kingdom of that state, with an area of 9862 sq. m. By the treaty of Versailles the greater part of the prov. was ceded to Poland; some dists., on the plebiscite being taken, remained Ger. (area 2978 sq. m.). It was bounded on the N. by the Baltic, S. by Poland and the prov. of Posen, E. by the Polish corridor separating it from E. Prussia, and W. by the provs of Brandenburg and Pomerania.

**West Punjab,** *see* PUNJAB, West.

**West Riding Regiment (The Duke of Wellington's Regiment (West Riding)),** formerly 33rd and 76th Foot. The 33rd was raised in 1702 and served in various campaigns in Spain, Flanders, and at Dettingen. The future duke of Wellington commanded the regiment in 1794-95 and was later its colonel. It served under him at Waterloo. At his death in 1852 the regiment was given the title 'Duke of Wellington's' and granted his crest and motto as a badge. It also served in the Crimea. The 76th was raised in 1787 and served with great distinction in India, at Seringapatam, Allypore, Looswarree, and Delg. Later it went to the Peninsula and afterwards to Canada. The regiments were linked in 1881, and gained honours in the S. African War, 1894-1902. During the First World War, twenty-one battalions were raised, which served in Franco, Flanders, Italy, Gallipoli, and Egypt. In

the Second World War one battalion especially distinguished itself in the fight for Hill 102, just S. of Bristot, in the battle of Normandy (1944). The 7th Bn. as part of the 147th Brigade of the 49th Territorial Div., also distinguished itself in Normandy. Later the regiment fought in the Nijmegen area. In the previous year the regiment added fresh laurels to its list, by its part in the campaign of the First Army in Tunisia, notably in their gallant action at Banana Ridge (April 20). Other units of the regiment fought in the Burmese campaigns.

**West Saxon Dialect,** *see under* ENGLISH LANGUAGE—Old English.

**West Surrey Regiment, Queen's Royal,** commonly called 'The Queen's,' after Catherine of Braganza, consort of Charles II., who brought to the Brit. crown as her dowry the city of Tangier. In 1661 the 2nd Regiment of Foot was raised specially to garrison this tn., and was at first known as 'The Tangier Foot.' (*See also* ROYAL DRAGOONS.) The tn. was evacuated in 1684, when the regiment came home for the first time. Under the infamous Col. Kirke it took part in suppressing the Monmouth Rising and in the subsequent reprisals. In the following year it became the Queen Dowager's Regiment, taking its title from the widowed Catherine. But the designation 'Royal' was bestowed by William III., whom it served faithfully at Tongres. The regiment served as marines on the Glorious First of June in 1794, and on shore against Napoleon in Egypt and the Peninsula; the 2nd Battalion fought in the S. African war.

Many battalions were raised in the First World War for service on the Western Front and Near E. In the Second World War it presented the unusual spectacle of an entire brigade (in the 56th Div.), consisting of territorial battalions of this one regiment, which fought in Africa and in Italy from the Salerno landing onwards.

**West Virginia,** the 'Panhandle State,' S. Atlantic state of the U.S.A., separated from Virginia in 1863. It has an area of 24,181 sq. m., and is bounded on the N.E. by Pennsylvania and Maryland, on the S. and E. by Virginia, and W. by Kentucky and Ohio. It is about 240 m. long from N. to S. and 160 m. broad. The Ohio R. forms the N. boundary of the State and many of its trib. flow through it. The Potomac forms part of the N.E. boundary, while the Alleghany and Shenandoah Mts. border the S.E. The climate is agreeable and healthy. About two-thirds of the soil is covered with forest; W. V. produces more hardwood than any other state, except Arkansas. The soil is fertile, and many of the mts. are topped with flat meadows. The chief agric. crops are Indian corn, wheat, oats, rye, buckwheat, potatoes, hay, and tobacco. The chief fruits grown are grapes, apples, plums, peaches, and pears. Farming units are small, averaging about 89 ac. Soft coal, natural gas, petroleum, and stone are produced. Manufs. include iron and steel products, glass, and chemicals. Primary education is free for all from

6 to 21 years, and compulsory between the ages of 7 and 16. W. V. has limited racial segregation. Pop. (1948) 1,915,000 (Negro 118,000). The state cap. is Charleston, but the most important city is Wheeling, where most of the important industries, except salt manuf., are located. Other tns. are Huntington (76,000), Clarksburg (30,500), Parkersburg (30,100), and Fairmont (23,000). There are 3750 m. of steam railway, besides over 300 m. of electric track. The State has a new system of improved highways totalling 33,000 m., of which 4400 m. are surfaced. There are 33 airports. There is a senate of 32 members and a House of Delegates of 94; W. V. sends 2 senators and 6 representatives to Congress. See C. H. Ambler, *West Virginia: The Mountain State*, 1940.

**West Wall ('Siegfried Line').** The Ger. reconquest of the Rhineland in 1936 was carried out because the Ger. leaders wished to start erecting the W. W. as soon as possible in order to thwart any military aid which France might attempt to bring to her E. allies. The first defences, actually begun in 1934, passed between the R. Main and the Wetterau dist. and across the plain bounded by the Taunus and Vogelsberg. This line, about 100 km. long, ran from Aschaffenburg through Bieber, Gelnhausen, Wächtersburg, Büdingen, Stockheim, and Reichelsheim. Another line of defences ran from Mosbach, at the foot of the Odenwald, Gründelsheim, Heilbronn, Lauffen, and Beilighheim to the region between Leonberg and Sindelfingen, 15 km. W. of Stuttgart. Other defences in the former demilitarised zone ran along the ridge of the Black Forest, beginning S. of Pforzheim and ending on the Swiss frontier, and from Voreifel to the Palatinate. Later work was begun on the line of defences from the Eimereich region to the vicinity of Düsseldorf. The view taken by the Ger. general staff was that this huge fortified girdle could be held by very small forces against the entire Fr. and Belgian armies, so that Germany's main offensives could be conducted freely elsewhere. After the 1939-45 war had begun the Gers. extended the W. W. eastwards from its S. extremity at Basle to Lake Constance, for a length of about 100 m. along the Ger.-Swiss frontier.

In the result the W. W. proved a formidable obstacle to the advance of the Anglo-Amer. armies, who, however, aided by the air forces, overcame the defences in about six months. One fatal flaw in the W. W. was that, in the Palatinate, and in the Eifelberg, the Gers. were compelled to fight with the Rhine at their backs.

**West Yorkshire Regiment.** see YORKSHIRE REGIMENT.

**Westward Ho!** seaside resort of Devonshire, England, on Bidford Bay, 2½ m. N.W. of Bidford. It is in the urb. dist. of Northam, and takes its name from Charles Kingsley's novel. Rudyard Kipling was educated at the United Services College (now a terrace of houses) which he immortalised in *Stalky & Co.* The golf links on Branton Burrows are world-famous.

**West Wycombe,** vil. of Buckinghamshire, England, 3 m. N.W. of High Wycombe and adjacent to it. Most of the vil., which contains many seventeenth and eighteenth-century buildings, belongs to the National Trust. The latter also owns *West Wycombe Park*, 2 m. W. of High Wycombe on the Oxford Road. On the hill is a curious church, built in 1763, surmounted by a golden ball capable of holding twelve persons, which has associations with Dashwood.

**Wet, De, and Wette, De,** see DE WET, and DE WETTE.

**Wetaskiwin,** city of Alberta, Canada, 42 m. S. of Edmonton, a junction of the Canadian Pacific Railway. It is the marketing centre of a good agric. dist. Lumbering and coalmining are carried on in the area, there are natural gas supplies, and oil-bearing strata have been found a few m. to the W. There are grain elevators, a flour mill, creameries, and a timber works. Pop. 4000.

**Wetherby,** mrkt. tn. of the W. Riding of Yorkshire, England, on the Wharfe, 8 m. S.E. of Harrogate. It has mineral water and light engineering industries, a cattle market, and trade in agric. produce. Steeplechasing events are held here. Pop. (tn), 4200: (urb. dist.), 21,800.

**Wetteren,** tn. in the prov. of E. Flanders, Belgium, 8 m. S.E. of Ghent, on the Scheldt. Chief manufs. are cotton and woollen goods, lace, and tobacco. It is the site of the Belgian national powder-mill. Pop. 19,300.

**Wetterhorn,** mt. in the Bernese Oberland, Switzerland, E. of Grindelwald, about 12 m. from Interlaken. It consists of three peaks, of which the middle, or Mittelhorn, is the highest (12,166 ft.). The other two are known as the Hasli Jungfrau (12,149 ft.) and the Rosenhorn (12,110 ft.). The mt. was ascended first in 1844.

**Wettin, House of,** Ger. royal family dating from about the mid-tenth century. It gave rise to sev. European royal houses, including the Eng. The founder of the line was Count Dedo (d. 957). Dietrich II., married a daughter of the margrave of Meissen. The importance and extent of the dominions of the H. of W. increased greatly. Lower Lusatia (1135) and the Mark of Meissen (1130) being recognised as possessions. Nuremberg became their cap. Conrad I and his descendants were rulers from 1123 to 1288, when W. co. and castle near the Saale were sold to the archbishop of Magdeburg. He retained them till the Peace of Westphalia (1648); the elector of Brandenburg then claimed them, and they were finally annexed to Prussia (Saxony). See G. E. Hoffmeister, *Das Haus Wettin*, 1889.

**Wewak,** airfield and harbour on the N. coast of Brit. New Guinea. From 1942 it was developed by the Jap. as a main supply base. Frequently attacked from the air, W. was recaptured during May, 1945.

**Wexford:** 1. Maritime co., in the prov. of Leinster, Eire, bounded on the N. by Wicklow, S. and E. by St. George's



Channel, W. by Waterford and Kilkenny. The surface is hilly in the N. and W., the greatest heights being reached in Mt. Leinster (2610 ft.), and Blackstairs Mt. (2409 ft.). Owing to sandbanks the coast is dangerous, and the only opening of importance is Wexford Harbour and Bay, while Waterford Harbour divides it from the co. of that name in the S. Off the coast to the S.E. is Tusker Rock with a lighthouse, and further S. are the Saltee Is., beyond which there is a lightship. The prin. rivs. are the Barrow and the Slaney, both navigable for a long distance. Agriculture is successfully carried on, and sheep and cattle, pigs and poultry are reared. Barley is the main crop, other cereals and sugar-beet are grown extensively; the fisheries are important. The prin. tns. are Wexford (the co. tn.), New Ross, Enniscorthy, and Gorey. The co. returns five members to Dail Eireann. There are a number of anct. monuments in the co., including Dunbrody Abbey, Ferns Abbey, and the castles at Ferns and Enniscorthy. The area is 908 sq. m. Pop. 91,700. 2. Municipal bor. and seaport, cap. of co. Wexford, Eire, on the R. Slaney. Its importance is mainly due to the harbour, which is formed by the estuary of the riv., but owing to a bar across the mouth big vessels are unable to enter at ebb tide, and in consequence the harbour of Rosslare was built and connected by rail with W. (8 m.). The tn. is of anct. foundation. It was walled by the Danes in the ninth century, and occupied by them until 1169; it received its first charter in 1318; it contains the ruins of St. Sepulchre's Abbey and some fragments of the old tn. walls, and the barracks are on the site of an anct. castle. The tn. was besieged by Cromwell in 1649, garrisoned by William III. in 1690, and was the centre of Civil administration during the rebellion of 1798. The chief industries are the manuf. of agric. machinery, and farm implements, laminated springs, and furniture. The tn. is the centre of important fishery. Pop. 12,300. See P. H. Hore, *History of Wexford*, 1906.

**Wey**, riv. of Hampshire and Surrey, England, rises near Alton in Hampshire, and flows N.E. past Godalming and Guildford to join the Thames at Weybridge. Length 35 m.

**Weybridge**, urban dist. (with Walton) of Surrey, England, at the junction of the Wey and the Thames. W. is mainly a residential tn. Pop. Walton and Weybridge, 32,000.

**Weyburn**, tn. in S. Saskatchewan, Canada, 73 m. S.E. of Regina, a commercial and industrial centre, on the main route from the United States into W. Canada. The Cleveland Manufacturing Company have large works here for the manuf. of petrol engines, stoves, etc. Pop. 7000.

**Weyden, Rogier Van Der**, see ROGIER VAN DER WEYDEN.

**Weygand, Maxime** (b. 1867), Fr. soldier of Belgian descent, b. at Brussels. Educated at St. Cyr, he was commissioned in the cavalry in 1888. He served in the

colonial army until 1914, when he became chief-of-staff to Foch. He went to Poland in 1920, reorganised the Polish army, and inflicted a defeat upon the Russians. From 1923 to 1924 he was high commissioner in Syria. In 1930 he became chief of the general staff, and in 1931 president of the supreme war council.

On May 19, 1940, he was appointed Chief of the Fr. general staff and commander-in-chief in all war theatres. After the Gor. break-through he organised a defensive line on the Somme, which was broken during early July. On the eve of the Fr. collapse, when Reynaud resigned, Pétain (q.v.) appointed W. his vice-premier, and thereafter it was never evident on which side he was really acting. In Sept. 1940, he was appointed High Commissioner for Fr. Africa, and in July 1941, governor-general of Algeria, while retaining his position as delegate-general of the Vichy Gov. in Fr. N. Africa to which he had been appointed a month earlier. But his administration evidently did not satisfy Pétain, for in Aug. 1941, Darlan was given power to direct Vichy's general policy in N. Africa, thus rendering W. subordinate to him, and soon afterwards, W. was divested of all military powers while remaining nominally delegate-general. After the Allied landings (Nov. 1942), matters came to a climax, his post of delegate-general was abolished, and he retired, probably at the instance of Hitler. He was arrested by the Gers. in 1942 and interned until freed in 1945. In 1948 the sentence of infamy, passed upon him as a member of the Vichy Gov., was quashed. See J. Weygand (trans. by J. H. McEwen), *The Role of General Weygand; Conversations with his Son*, 1948.

**Weyman, Stanley John** (1855-1928), Eng. novelist, b. at Ludlow, and educated at Shrewsbury, and Christ Church, Oxford. Called to the Bar in 1881, he practised for about eight years. His novels are nearly all historical, and in this vein he was specially popular. His books include: *A Gentleman of France* (1893), *Under the Red Robe* (1891), *The Red Cockade* (1895), *Chippings* (1906), and *Queen's Folly* (1925).

**Weymouth**: 1. and Melcombe Regis, Seaport, holiday resort, mun. bor. of Dorsetshire, England, at the mouth of the Wey. Its popularity as a seaside resort dates from the time of George III., who often resided at Gloucester House. W. and M. R., on opposite banks of the riv., are connected by bridges. To the S. of Weymouth Bay is the Isle of Portland. The chief industries are the quarrying of Portland stone, shipbuilding, sail and ropemaking, brewing, and fishing. Pop. 36,300. 2. Township of Norfolk co., Massachusetts, U.S.A. It manufs. boots and shoes, nails, prefabricated houses, and garages. Pop. 23,900.

**Whakaaro**, see under MAORIS.

**Whale**, name for most of the members of the family Cetacea, in the class of mammals, hunted for the oil, whalebone, spermaceti, ivory, etc., which they yield. The family of Cetacea is divided into two groups, the toothed Ws. (odontoceti) and

the whalebone Ws. (mystacoceti), the former including the sperm W., or cachalot (*q.v.*), the dolphins, porpoises, and narwhal; the latter, the right Ws. or baténas, from which are derived oil and whalebone; and the orquals. The largest of the toothed Ws. is the cachalot (*Physeter macrocephalus*). It yields the most valuable of the W. oils, in addition to spermaceti and ambergris. The bottle-nosed W. occasionally visits Brit. waters. The white W. is found mostly off Labrador and Canada. Of the whalebone or right Ws., the most important formerly were the Greenland W. (*Balaena mysticetus*) and the Biscayan W. or Nordkaper (*B. glacialis*). Ws. are the most thoroughly aquatic of all mammals, the forelimbs being reduced to fin-like paddles and all external traces of the hind limbs having virtually disappeared. They occur in all seas and by loose attachment of the ribs are able to expand the chest and remain a long time under water. Most Ws. are inoffensive creatures and swim in herds. When they rise to the surface, the heated air expelled condenses and forms a column of spray, the 'spouting' of the W. Ws. stranded on shore die by suffocation, their own weight crushing the lungs.

*Whale Fisheries* are of auct. origin, the Norwegians and the Basques having sought the valuable whalebone and oil-producing mammals as early as the ninth century; the Norwegians are still foremost in this industry. In modern times whale fishing, chiefly of orquals, has become so profitable commercially that the W., a slow-breeding animal, is in danger of total extinction, and international agreements limit the total kill. (See DISCOVERY COMMITTEE.) Practically the whole of the animal is utilised in one form or another: the oil as a lubricant, or for making soap, candles, and margarine (W. oil forms ten per cent of the total world production of edible oils); the whalebone is employed by corset manufacturers and in the brush trade; the prepared flesh is used as a cattle-food; the flesh and ground bones as soil fertilisers; ambergris, an intestinal exudation of diseased sperm Ws., is a valuable ingredient in the manuf. of perfumes. Some parts of the flesh are suitable for human consumption.

In 1870 Føyn, a Norwegian, invented the shot-harpoon which revolutionised whaling and made it more humane, the harpoon being shot from a gun into a vital part of the sea-monster. An electric harpoon has been used since 1949, passing an electric current to paralyse or kill the animal. A 'factory ship,' for processing the catch, is used, with some ten vessels for hunting. In 1937, 54,835 W. were killed. W. Fs. are carried on near the coasts of Greenland and Newfoundland, but the Antarctic, in the summer months, supplies eighty per cent of the catch. In the Azores the sperm W. is still hunted by a hand harpoon in the nineteenth-century style. Herman Melville's *Moby Dick*, and *The Cruise of the Cachalot* (1906), by F. T. Bullen, give a good description of whaling. See

also A. G. Bennett, *Whaling in the Antarctic*, 1931; A. G. Villiers, *Whaling in the Frozen South*, 1931; J. J. Jenkins, *Whales and Modern Whaling* (new ed.), 1945; R. C. Murphy, *Logbook for Grace*, 1948; J. Grierson, *Air Whaler*, 1949; and J. R. Norman and F. C. Fraser, *Giant Fishes—Whales and Dolphins*, 1949.

**Whale, White**, see BELUGA.

**Whale, Sperm**, see CACHALOT.

**Whalley**, vil. of Lancashire, England, on the Calder, 8 m. from Blackburn. Here in 1206 was founded a Cistercian Abbey, of which some remains exist. Pop. 4000.

**Whangarei**, tn. of Whangarei co., N. Is., New Zealand, 131 m. N. of Auckland by rail. It is the chief tn. and seaport for an extensive agric., pastoral, and fruit growing dist. Coal mining is carried on at Kamo 4 m. away, whilst dairying is also an important industry, there being sev. factories in the dist. There are also cement works and sawmills. Pop. 10,000.

**Wharfedale**, in the W. Riding of Yorkshire, England, is that part of the valley of the Wharfe beginning near Wetherby and continuing until the source of the riv. on Cam Fell. Lower W. is a rich agric. dist. At Harewood stands a ruined medieval 'tower type' castle. Ilkley, the largest tn., was the Rom. settlement of Olcana. Upper W., above the ruins of Bolton Priory founded in 1120, and Barden Tower built by Henry, Lord Clifford, is pastoral country of great beauty with noted literary associations: its centre is Grassington. Hubberholme church with its rood loft is at the head of W. See Ella Pontefract, *Wharfedale*, 1938.

**Wharton, Thomas** (1616-73), Eng. anatomist and physician at St. Thomas's Hospital, London. He is chiefly known for *W.'s duct*, the duct (which he discovered) of the sub-mandibular salivary gland, and for *W.'s jelly*, the connective tissue of the umbilical cord.

**Wheat Harvest, Feast of the**, see LAMMAS DAY.

**Wharton, Thomas Wharton, First Marquess** of (1618-1715), Eng. statesman, b. at Woburn, was a prominent supporter of the Revolution of 1688. He is the reputed author of *Lilli-Burlero* or *Lilli-bullero* (*q.v.*). He was a commissioner for the union with Scotland, 1706, and in that year was given an earldom. He was one of those who proclaimed George I. as king of England, and was rewarded with a marquessate, and the office of lord privy seal.

**Wheat**, or *Triticum*, grass, the origin of which has not been definitely estab. There are many hundreds of forms in cultivation, and many schemes of classification have been suggested: according to one of the schemes they are classified as varieties or sub-varieties of the three following species: one-grained W. (*T. monococcum*), which possesses a flat, short, compact ear; the two flowers of the spikelets produce only a single ripe grain. It is sometimes cultivated on poor soils, in mountainous dists. of Central Europe. Polish W. (*T. Polonicum*) has awned glumes, which enclose all the flowers in the spikelet, only two of which are fertile.

The grain is large and very hard ; the crop is grown in S. Europe, but is unsuited to Brit. climate. *T. sativum* is divided into three races : (1) Ordinary spelt Ws., grown on poor soils, in Central Europe ; (2) Two-grained spelt Ws., grown in S. Europe chiefly for the manuf. of starch ; (3) *T. sativum tenax*, which has given rise to all the most important varieties, classified in four sub-races, each of which is commonly regarded as a separate species. Hard or flint W. (*T. durum*), is grown around the Mediterranean chiefly for making macaroni. Turgid or rivet W. (*T. turgidum*) produces red grain with very tall stiff straw, used for thatching purposes. The grain makes dark coloured flour, and is too poor in gluten for bread-making. Dwarf Ws. have short stiff straw with small grains. Common W. (*T. vulgare*) includes all the more important varieties grown in the great W. dists.

there is a scanty rainfall, e.g. it is only 9 in. in the growing regions of Western Australia, but the abounding sunshine results in superior quality. In Russia the low average, which has persisted for sev. decades is due to the backward state of the industry, the expectations of a rapid increase through present-day activity not having been fulfilled. In Argentina droughts, floods, frosts, and locusts seriously interfere with a regular W. yield. The low yield in India is due partly to the arid soil and partly to backward methods. For diseases of W., see BUNT, HESSIAN FLY, RUST, and SMUT.

The great W.-importing countries are in the W. of Europe where the pop. is largely industrial, the United Kingdom standing at the head of the list. The acreage and production of W. in some of the Brit. Commonwealth countries for 1948 are shown in the following table

	Acreage under wheat	Production (bushels)
United Kingdom ..	2,279,000	88,144,000
Canada .. ..	24,106,000	393,345,000
Australia .. ..	13,021,000	189,670,000
India and Pakistan ..	30,190,000	321,477,000
Union of South Africa ..	2,400,000	17,543,000
New Zealand .. ..	150,000	5,800,000

The acreage under wheat and production in the chief foreign producing countries

Country	Area harvested Thousands of acres		Production Thousands of bushels	
	Average 1935-39	1948	Average 1935-39	1948
Argentina .. ..	15,834	12,000	221,769	191,065
Bulgaria .. ..	3,362	—	69,080	—
China .. ..	48,572	52,800	750,000	925,000
Czechoslovakia ..	2,175	2,146	57,000	51,370
Egypt .. ..	1,464	1,652	15,818	41,700
France .. ..	12,566	11,100	286,510	300,000
Germany .. ..	4,250	3,420	147,000	108,750
Greece .. ..	2,172	2,105	30,425	30,931
Hungary .. ..	4,091	3,368	91,210	58,175
Italy .. ..	12,577	11,860	278,366	250,000
Japan .. ..	1,735	1,633	49,954	38,287
Poland .. ..	3,260	2,842	74,000	43,641
Persia .. ..	4,191	—	72,128	70,131
Rumania .. ..	6,900	5,930	112,000	90,555
Spain .. ..	10,368	9,900	134,500	98,120
Turkey .. ..	8,973	9,881	135,690	145,000
U.S.A. .. ..	77,293	71,904	758,629	1,288,106
U.S.S.R. (estimated) ..	104,000	95,000	1,240,000	1,025,000
Yugoslavia .. ..	5,346	4,650	96,740	92,750

The most modern view of W. classification is based upon the number of chromosomes, which are divided into sets of seven (genoms).

Winter Ws. are sown in autumn, and spring varieties usually in Feb. The average yield per ac. in different parts of the world in 1948, is shown in the following table. Cases of low average are due to varying causes. In Australia

See J. O. Rolval, *Wheat in Great Britain*, 1934 ; H. I. Moore, *Crops and Cropping*, 1944 ; *Statistical Abstract of British and Foreign Trade and Industry* (for years after 1931) ; *The Wheat Situation, 1949* (Office of Foreign Agric. Relations of the U.S. Dept. of Agriculture), 1950.

**Wheat Commission**, see AGRICULTURE, *Agriculture during and since the First World War*.

**Wheatear**, *Fallow Chat*, *Fallow Finch*, or *Saxicola oenanthe*, Brit. bird, being a summer migrant to Britain, often arriving in Feb. It is about 6 in. long, grey on the upper parts with a black streak from beak to ear and with black quill feathers, wing coverts, and tail feathers. In flight a white patch on the lower back and tail is conspicuous. The underparts are white with a buff tinge on the breast. Its food consists chiefly of insects.

**Wheat Fly**, see *HESSIAN FLY*.

**Wheatley, Francis** (1747-1801), Eng. painter, b. in London. His fame rests chiefly on the series 'Cries of London'; he also painted landscapes and portraits. In 1778 he first exhibited at the Royal Academy, becoming associate in 1790, and R.A. in 1791.

**Wheatstone's Bridge**, electrical apparatus for the accurate measurement of resistances. It was developed in 1847 by Sir Charles Wheatstone (1802-75), a Brit. electrician and inventor of the stereoscope, electric clock, and meteorological instruments. See *ELECTRICITY* and *MAGNETISM (CURRENT ELECTRICITY)*, *Wheatstone's Bridge*.

**Wheel Animalcules**, see *ROTIFERA*.

**Wheeling**, city and co. seat of Ohio co., Virginia, U.S.A., 46 m. by rail S.W. of Pittsburgh on the Ohio R. Tobacco, glass, steel, textiles, and clay goods are manufactured. Pop. 61,000.

**Wheel-lock**, see *under FIREARMS*.

**Wheels**. The invention of W. was part of the Bronze Age economy, and is associated with bronze tools and weapons. The wheeled cart was known in Mesopotamia about 3000 B.C., in Egypt not before 1600 B.C., in Britain not until the Early Iron Age, while in America and other places it was not known until it was brought by modern European trade and settlement. Many prehistoric monuments were constructed from blocks of stone hauled from the quarries, with the aid, no doubt, of rollers beneath a sledge. From this apparatus was evolved the earliest W., a slice from a log attached solidly to an axle. Later the W., still crude in form, revolved upon a fixed axle. This solid form, however, was necessarily heavy, and as an improvement, in Near E. lands, spokes were introduced about 2000 B.C., thus lightening the structure and providing levers to propel the vehicle if the need arose. The potter's wheel, another great milestone in human civilisation, was known, with the cart, in Mesopotamia. To-day the W. is indispensable and assumes many forms of varied complexity and use, not only in transport but in the internal structure of machines.

**Whelk**, or **Buckle** (*Buccinum undatum*), carnivorous mollusc, common off Brit. coasts, much used as an article of food. The shell is grey or brownish white, spirally grooved and with numerous raised ridges.

**Whernside**, mt. in Yorkshire, England, in the moorlands at the junction of the co. with Westmorland and Lancashire. It is one of the highest of the Pennine peaks, rising to 2414 ft.

**Whickham**, urb. dist. of Durham, Eng-

land, near the R. Derwent. It has coal-mines, iron, steel, and chemical works, flour mills, and soap works. Pop. (estimated), 22,800.

**Whig**, formerly the designation of one of the great political parties in England. The term is of Scottish origin, and was first used in Charles II.'s reign. According to some it was derived from *whigamores* or horse drovers, and applied as a term of contempt, though Burnet in his *History of My Own Times* gives a different derivation. In England it was eventually assumed as a honoured party name by those politicians who took the lead in placing William III. on the throne. See *POLITICAL PARTIES*.

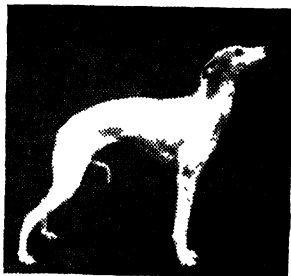
**Whimbrel**, see *CURLEW*.

**Whin**, see *FURZE*.

**Whinberry**, see *BLAEBERRY*.

**Whinchat**, or *Saxicola* (or *Pratincola*) *rubetra*, bird that visits Britain in summer, favouring heaths and open places, where it feeds principally on insects. The centre of the throat and breast are a light cinnamon-rufous, as also are the sides of the body, and the abdomen; the general colour above is brown; the headfeathers are edged with sandy-buff. It is a summer visitor to most parts of Europe, and breeds as far N. as the Arctic Circle.

**Whip**, Brit. party official. All major parties in Parliament have Ws., who see that the members of their respective parties vote as required by the party leaders. Gov. Ws. are members of the administration but opposition Ws. are unpaid. Administrative bodies like the L.C.C. also have Ws. The term is sometimes used of the message sent to members advising them to be present in Parliament on a certain day. The importance of the occasion is gauged by the amount of underlining of certain words, thus the term 'three-line Whip.'



1 Fall

WHIPPET

**Whippet**, dog, particularly favoured in the N. of England, where it is much used for running races, being capable of tremendous speed; trained to make for the towel held at the end of the course by its owner. The W. was produced by crossing the fox terrier with the lt. greyhound, and then breeding back to the Eng. greyhound. It is bred in various colours, including black, red, white, fawn, and

brindle, and its appearance is that of a greyhound in miniature. Its head is long and lean, with small rose-shaped ears, long muscular neck, deep capacious chest, long back, arched over the loins; the fore legs are moderately long, and the hind-quarters strong and broad with muscular thighs; the tail is long and tapering.

**Whipping**, see FLOGGING.

**Whipple, George Hoyt** (b. 1878), Amer. pathologist, b. at Ashland, New Hampshire. He studied at Yale and Johns Hopkins Univs. From 1914 to 1921 he was research prof. at California Univ., becoming prof. of pathology at Rochester Univ. in 1921. He is especially known for the introduction of the liver diet for pernicious anemia, and for this work he shared the Nobel prize for medicine in 1934.

**Whip-poor-will**, or *Antrostomus vociferans*, N. Amer. goat-sucker (*q.v.*), or night-hawk, so called from its cry at nights during its breeding season.

**Whipsnade Park**, property of the Zoological Society of London, is designed for the breeding and exhibition of wild animals and as a sanctuary for native Eng. wild birds and plants. W. P. is on the edge of the Dunstable Downs, Bedfordshire. The park is 500 ac. in extent. Some animals and birds are without enclosures or kept in enclosures to which the public are admitted. The park was opened in May 1931.

**Whip-snake**, see DRYOPHIS.

**Whirlpool**, vortex or eddy in water caused by the interaction of two or more currents of different strength, often by the re-joining of a current divided by an obstacle. Dangerous Ws. may occur where tidal currents mingle on coasts; in myth and fiction the dangers are largely exaggerated, as in the case of Charybdis in the Straits of Messina and the Maelstrom of the Norwegian coast.

**Whirlwinds**, general, unscientific term for atmospheric vortices more usually applied to those not so destructive as typhoons or tornadoes, but sufficiently marked to cause minor acts of damage. They are liable to spring up in deserts as dust devils. Some portion of the ground becomes more strongly heated than surrounding parts, the air in contact rises in temp., becomes less dense, and therefore rises, taking dust and loose paper, etc., with it. The central fall in pressure causes the swirling motions, which may be either clock-wise or anti-clockwise. When of large size, a m. or so, and in humid weather, they may have developed from thunderstorms. The lifting action is sometimes considerable, carts, trees, etc., being bodily transported. Sometimes the vertical height of the disturbance is quite small. See HURRICANE, TORNADO, TYPHOON, WATERSPOUT.

**Whisk**, see UNDO RUFF.

**Whisky**, or **Whiskey**, spirit obtained by the distillation of a mash of cereal grains saccharified by the diastase of barley malt. The cereals employed are barley, maize, rye, and malted barley. Potatoes, rice, sugar, and molasses are

not now used for the manuf. of W. in the United Kingdom, although spirit is produced in different parts of the world from these materials. The substances are subjected to the processes of mashing, pitching, and fermenting, and the resulting liquid, called the 'wash,' undergoes distillation (see BREWING). In Scotland and Ireland, the distillation is carried out in fire-heated pot-stills, which consist of large copper kettles or pots having a pear-shaped head and connected to a receiver by a copper worm which runs through a tub of cold water. The Scotch pot-still W. is entirely malt W. Irish pot-still W. is made from a mixed grist of barley, oats, maize, and malt, the last-named forming about one-third of the mixture. Potteen or potheen is made in illicit stills from sugar and molasses. In the United Kingdom, W. is also made in a patent still where rapid steam distillation gives a more highly rectified and stronger spirit. See COFFEY'S STILL. W. is generally blended when in bond. In pot still W., the secondary constituents, chiefly higher alcohols, are present to the extent of about 0.20 per cent. The cause of improved flavour of W. is in part due to the interaction of the spirit with the substances absorbed by the casks from the wine which they previously contained. W. straight from the still is colourless, and the colouring of the various brands is carried out by storage in wine casks and by addition of a small quantity of sugar caramel. Pot-still W. varies in strength from 15° to 25° overproof, while patent-still W. is generally 65° to 70° overproof, when distilled. Much of the latter quality spirit is used for making gin and for manufacturing and scientific purposes. For use as a beverage, the patent-still W. is matured in casks for sev. years and carefully blended with matured pot-still W. to produce Blended Scotch. It was declared by the Census of Production Authorities in 1926 that consumption had declined in the United Kingdom, but not in Ireland.

**Proof Spirit**.—Spirit of proof strength is defined as that which at the temp. of 51° F. (10.6° C.) weighs exactly twelve-thirteenths of an equal measure of distilled water at the same temp. This mixture of alcohol and water has a specific gravity of 0.91976 at 15.6° C. and contains 49.28 per cent. by weight, or 57.10 per cent. by volume, of anhydrous alcohol. *Overproof* and *Underproof* refer to strengths of alcohol and water mixtures containing more or less alcohol respectively.

**Whist**, card game for four players or in the case of a 'whist drive' for any number of sets of four players, the object of which is to score tricks. Every trick made in excess of six (thirteen being the highest possible) scores one point; in *short W.* five points make a game, and a score of two games out of three wins the 'rubber'; in *long W.* ten points make a game. In a W. drive the winners are those individual players who score the highest number of tricks or points, there being no question of a partnership as

such taking a prize, because the individual players move from table to table according to the result of each hand. Partners holding all four honours (assuming the players elect to play for honours), i.e. the ace, king, queen, and knave of trumps, score four points; three honours score two points. In *American W.* seven points make a game, and honours are not counted. The game of *W.* is a very old one (originating about 1621), and derives its name, apparently, from the Cornish *huist* (silence), from the supposition that it requires concentration and silence on the part of the players to play the game.

**Rules.**—The deal commences with the player who cuts the lowest card in the draw, and then passes on to the player on his left, and so on. The trump suit is determined by turning up the last card dealt. All the exposed cards are liable to be called and must be left face upwards on the table. In no case can a player be compelled to play a card which would oblige him to revoke, but the call may be repeated at every trick, until such card has been played.

**Dummy W.** is played by three players. One hand, called dummy's, lies exposed. Dummy deals at the commencement of each game. He is not liable to penalties for revoke, as his adversaries see his cards. If he revokes and the error is not discovered until the trick is turned and quitted it stands good. Double dummy is played by two players, each having a dummy or exposed hand for his partner. **German W.** is a *W.* for two players. The cards are dealt as in *W.*, the top card of the remainder being turned up. The suit of this card is trumps. The dealer's opponent leads and the winner of the trick takes up the exposed card, and his opponent takes the card from the top of the pile which he must show to the other player. The next card on the pile is turned up, and the winner of the preceding trick leads.

Scoring is on points, the winner scoring a point for every trick more than his opponent. A game is 50 points. *See also* **Solo Whist.**

**Whistler, James Abbot McNeill** (1834-1903), Amer. painter, lithographer, and etcher, b. at Lowell, Massachusetts. In 1851 he became a cadet at the military college at West Point, but he decided to follow art as a profession and in 1856 he went to Paris and entered the studio of Gleyre, where Degas and Fantin-Latour were fellow-students. He was greatly influenced by the newly discovered Jap. colour print and by the work of Monet. In 1859 he settled in London, but for a long time his work was little understood; and in 1877, when some of his nocturnes were shown at the Grosvenor Gallery, they were so fiercely assailed by Ruskin in *Fors Clavigera* that W. retaliated, suing his critic for libel, and claiming £1000. The case resulted in the plaintiff being granted one farthing damages, but throughout the trial W. had shown himself a master of wit. The famous portrait of Thomas Carlyle and his 'Battersea Bridge' are in the

Tate Gallery in London. His painting, notably his portraiture, was balanced, fragile, and exquisite, and occasionally this style, especially in his later work, became an end in itself.

The Ruskin trial is contained in W.'s own book, *The Gentle Art of Making Enemies* (1890), which embodies also many excellent critical comments on art. *See* the life by E. and J. Pennell, 1909; T. R. Way and G. R. Dennis, *The Art of Whistler*, 1903; J. Laver, *Life of Whistler*, 1930; and W. Gaunt, *The Aesthetic Adventure*, 1945.

**Whistler, Rex** (1905-44), Brit. painter, illustrator, and stage designer, b. in London. He was educated at Halcumbury and the Slade School of Art. Gifted with extreme imagination and little influenced by contemporary artists, W. excelled in portraying classical subjects in a Romantic vein, while his exquisite illustrations, notably of *Gulliver's Travels* and *Hans Andersen's Fairy Tales*, are masterpieces of draughtsmanship and design. His main achievement is the murals he painted, mostly for private patrons, though the Tate Gallery restaurant, an early work, is widely known. He was killed in the Second World War, leading tanks into battle in Normandy. *See* life by L. Whistler, 1918.

**Whitaker's Almanack**, Brit. work of reference, pub. annually since 1869. It was founded by Joseph W. (1820-95), a London publisher, who also pub. theological and fine-art works, and started the *Bookseller* (1858). **W. A.** is a comprehensive reference-book in one vol., and has become a standard work of its kind.

**Whitburn**: 1. Par. and vil. of Durham, England, 3 m. N. of Sunderland. It is a seaside resort, and is being developed by the Boldon U.D.C. Pop. 2600. 2. Par. and burgh of Linlithgowshire, Scotland, 3½ m. S.W. of Bathgate. It has coal and clay mines. Pop. of burgh (estimated), 5500.

**Whitby**, seaport of the N. Riding of Yorkshire, England, at the mouth of the R. Esk, 20 m. N.W. of Scarborough. The old tn. is very picturesque, with narrow, steep, irregular streets, and the new tn. is a popular seaside resort. Abbess Hilda built a monastery at Streoneshalh, now Whitby, in A.D. 657. Here, in the year 661, was held a Council or Synod (*see* next article). Here, too, lived Caedmon. The present abbey, reached from the tn. by 199 steps, dates from 1220, and within its walls may be seen the outlines of the Norman Abbey that succeeded that of Abbess Hilda. Near the abbey stands the par. church of St. Mary, part of which is Norman. The manuf. of jet ornaments is carried on, and the fisheries are important. W. has associations with Capt. James Cook, the circumnavigator, and also with whaling days. In Oct. 1950 potash deposits were reported in the W. area. Pop. 11,880.

**Whitby, Synod of, or Council of Whitby**, held A.D. 664, as the outcome of which England acknowledged the authority and accepted the usages of the Roman Church. It was convened at a time when Northumbria and Mercia followed the

Welsh or Celtic ritual while the rest of England followed the nations of the Continent. The issue was settled after discussion between Colman, the representative of the Celts, and St. Wilfrid (q.v.), who obtained from the former the admission that the Pope was the successor of St. Peter.

**Whitchurch**: 1. Par. of Glamorgan-shire, Wales, 14 m. N. of Llandaff. There are iron and tinplate works. Pop. 25,000. 2. Urban dist. and mkt. tn. of Shropshire, England, 19 m. N. of Shrewsbury. Brewing is carried on, and there is a cheese-fair. Pop. 7200. 3. Tn. of Hampshire, England, on the R. Test. There are textile and silk industries, and soap and jam factories. Pop. 2600.

**White, Sir George Stewart** (1835-1912), Brit. soldier, b. at Ballymena, co. Antrim. In 1853 he entered the Royal Inniskilling Fusiliers, and later became colonel of the Gordon Highlanders. He accompanied Lord Roberts to Kandahar, and was awarded the V.C. During the Boer War he successfully defended Ladysmith (1899-1900). He was governor of Gibraltar (1900-04), and was made a field-marshal in 1903. See life by Sir M. Durand, 1911.

**White, Gilbert** (1720-93), Eng. naturalist, b. at Selborne, Hampshire, and educated at Basingstoke Grammar School and at Oriel College, Oxford. He took holy orders and held curacies at Swarston, Selborne, and elsewhere. He devoted himself to the study of natural hist. around his par. In 1788 he pub. *The Natural History and Antiquities of Selborne* (new ed. pub. in Everyman's Library, 1950), which had been in preparation since 1771. This is his only famous work, though he pub. other papers on natural hist., and some sermons. *The Natural History* is founded on letters and retains the epistolary style throughout: it reflects W.'s unrivalled powers of observation, and is simple and informal in manner. The ed. of this work by T. Bell (1877) contains the rest of W.'s pub. works in a second vol. The Selborne Society (q.v.) pub. a facsimile ed. of his *Flora Selborniensis* in 1911. See life by W. S. Scott, 1916.

**White, William Hale**, better known as **Mark Rutherford** (c. 1831-1913), Eng. novelist, b. at Bedford. He entered the Admiralty as a clerk, and rose to be assistant director of contracts. His works include: *The Autobiography of Mark Rutherford* (1881); *Mark Rutherford's Deliverance* (1885); and *The Revolution in Tanner's Lane* (1887); *Catherine Furze* (1893); and *John Bunyan* (1905). See his *Early Life and Autobiographical Notes* (pub. posthumously, 1913).

**White Arum**, or **Arum Lily** (*Richardia africana*), perennial S. African marsh plant of the family Araceae. It has a thick root-stock, from which large arrow-shaped leaves arise on long stalks. The small yellow flowers are clustered round a spadix, surrounded by a white spathe. The Brit. cuckoo pint, or wake robin, is of the same family.

**Whiteboys**, secret Irish patriotic associa-

tion, formed about 1759 or 1760, and belonging to the group known as Ribbonism. It was condemned by the Catholic clergy, but only Catholics could belong, and they were all of the poorest class. Their aims and methods were varied in different parts of the country, but generally they assembled at night to destroy the property of their landlords, the Protestant clergy, tax or tithe collectors, and others who had made themselves obnoxious in the neighbourhood. The movement died down about 1855. The Westmeath Act (1871) declared Ribbonism illegal.

**Whitechapel**, dist. of London, E. of Aldgate, part of the metropolitan bor. of Stepney. In Commercial Street is Toynbee Hall; in the High Street is W. art gallery (1901), and in the W. Road is the London Hospital.

**Whitefield, George** (1714-70), founder of the Calvinistic Methodists in England, and one of their leaders in Wales, b. at Gloucester, studied at Pembroke College, Oxford, W. was ordained deacon by Bishop Benson (1736). After a visit to Gloucester and Bristol, he set off to join the Wesleys in America (1737). W. remained in America till towards the close of the year. He then began that course of preaching in association with Wesley which estab. Methodism (q.v.) as a popular faith. W. set the example of open-air preaching (1739) near Bristol, and made a great impression as an orator. His stern Calvinism led to a breach with the Wesleys, but he received great support from others, who in 1741 built a tabernacle for him in Moorfields, London. He was provided with a centre in Tottenham Court Road, London, where the Whitefield Tabernacle was built. His type of Methodism developed in the Calvinistic Methodist Church. His *Select Works* were ed. by J. Smith in 1830. See lives by L. Tyceman, 1876-7; J. P. Gledstone, 1900; and A. Belden, 1930.

**Whitefield**, urban dist. of Lancashire, England, also known as Stand, 6 m. N. of Manchester. It is mainly residential. Pop. 13,000.

**Whitefish**, see *Coregonus*.

**Whitehall**, main thoroughfare between Trafalgar Square and the Houses of Parliament in London. It takes its name from the palace built by Henry VIII., and destroyed by fire in 1698. It passes through the main courtyard of the old Whitehall Palace (originally built by Hubert de Burgh in the reign of Henry III.) and is 150 ft. wide. On the E. side are the War Office, the banqueting hall built by Inigo Jones, and old Whitehall Palace, now the Royal United Services Institution and Museum also designed by Inigo Jones; on the W. side, are the old Admiralty, the Horse Guards, the Treasury, Commonwealth Relations Office, Home Office, and Ministry of Health and Downing Street. The Cenotaph (q.v.) stands in the roadway. See G. S. Dugdale, *Whitehall Through the Centuries*, 1950.

**Whitehaven**, municipal bor., seaport and mkt. tn. of Cumberland, England, 41 m. S.W. of Carlisle. There is a

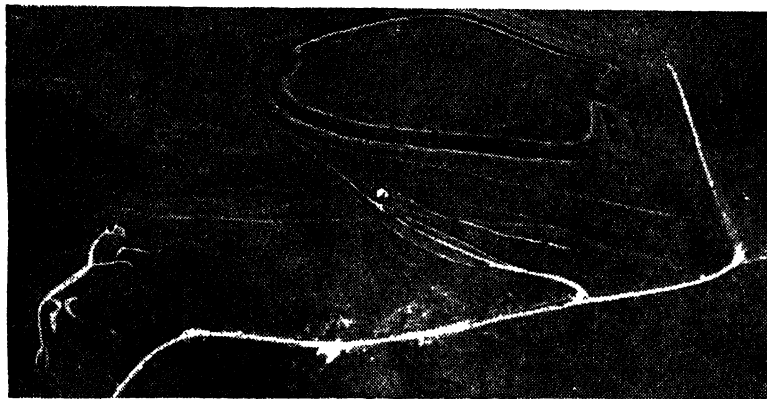
lighthouse on the W. pier of the harbour. It has extensive docks, collieries (some of which extend under the sea), clothing and silk manufs., brickworks, and a tannery and flour mill. Pop. 23,700.

**Whitehead, Alfred North** (1861-1947), Eng. mathematician and philosopher, b. at Ramsgate, educated at Sherborne School and Trinity College, Cambridge, where he became a Fellow in 1884 and lecturer (1885-1910) in applied mathematics and mechanics. He was lecturer in applied mathematics, Univ. College, London (1911-11), prof. at the Imperial College of Science, London (1914-24), and prof. of philosophy at Harvard Univ. (1924-37). W. was president of the Mathematical Association (1915-16). He collaborated with Bertrand Russell in *Principia Mathematica* in three large vols.

P. A. Schilpp, *The Philosophy of Alfred North Whitehead*, 1941.

**Whitehead, George** (c. 1636-1723), Eng. Quaker leader, b. near Orton, Westmorland, and converted by Fox. He wandered through England, preaching, and wrote many tracts in support of Quakerism. In 1661 he represented his group in Parliament at the reading of the anti-Quaker bill. He was imprisoned sev. times, being in gaol almost continuously between 1662 and 1672.

**White Horses and Hill-Figures**, are among the most interesting features of the topography of the chalk downland country of S. England. Nearly fifty hill-figures are known in Britain, of which all but four are in the chalk country; in this series are seventeen white horses, of which no less than eleven are in Wessex,



Ashmolean Museum

#### THE WHITE HORSE OF UFFINGTON AND UFFINGTON CASTLE

(1910-13) and wrote many philosophical works. W. was a Cambridge Platonist and his metaphysic is most fully expounded in his Gifford Lectures at Univ. of Edinburgh. *Process and Reality* was an essay in cosmology (1929), based on these lectures.

In W.'s *Tarrier Lectures* (1919) he rejected the conceptions of Nature which at that time formed the starting point of physics—that space and time provide the stage on which an endless performance is maintained by ponderable bodies, ether and electricity. He propounded the view that *events* constitute the ultimate components of reality. *Process and Reality* shows the close correspondence between his philosophy and that set forth in Plato's *Timaeus*. The fundamental idea is a process of divine development through which order is gradually evolved out of primeval chaos. The demiourgos of the *Timaeus* corresponds to W.'s 'God' and the Platonic 'ideas' or 'forms' to his 'eternal objects.' See

while the rest include giants, crosses, a stag of white quartz at Mornmond Hill, Aberdeenshire, an aeroplane, a crown, and an open-air collection of military badges made in 1916 at Fovant Down in Wiltshire. The most widely known of the hill-figures are the Uffington White Horse, below Uffington Castle, an earthwork fort on the Berkshire Downs; the Cerne Giant, on the hillside above Cerne Abbas village, near Dorchester, Dorset; the Long Man of Wilmington on Windover Hill on the escarpment of the S. Downs; and the Bledlow and Whiteleaf Crosses, close together on the Chiltern Hills. It so happens that these figures are in all probability of anot. construction. With a very few possible exceptions, all the others are modern. The Uffington Horse has inspired many imitations, of which a great number date from the eighteenth and early nineteenth centuries. The purpose of each hill-figure must be considered on its own merits. Some are landmarks, others have a religious purpose or are



memorials, while one at least is to be associated with a pagan fertility cult.

The Uffington White Horse, length 360 ft., has been known familiarly at least since 1084, when it is noted as a landmark in a charter of the Abbey of Abingdon, and by the fourteenth century it had given its name to the Vale of the White Horse. Sov. theories of its origin have been advanced: that it was cut by Alfred to commemorate his victory over the Dan. host in 871 at Ashdown; that it was a memorial of the conversion of the Saxons to Christianity; and that it was made for some purpose unknown by the Druids or the Romans. It is in fact of very anct. origin, as Sir John Evans pointed out in 1864 when he considered the similarity between this attenuated White Horse with disjointed limbs and bouk-shaped head and the horse represented on the gold and silver coins current in S.E. England at the end of the Early Iron Age. General opinion is that the Uffington Horse was a totem or cult object of the Belge, a tribe who occupied much of S.E. England in the century between 50 B.C. and A.D. 50.

The Cerne Giant lies in an area rich in prehistoric remains. Just beyond his head is a small four-sided earthwork, probably of the Early Iron Age, in which an ann. maypole celebration took place until quite recent years. Quite close by are the foundations of the Benedictine abbey of Cerne. All these points must be considered in any attempt to explain the age and purpose of this blatantly male figure, 180 ft. in height, with a great club in his right hand, his left outstretched as though in the act of grasping. He is represented in outline, marked by a 2 ft. trench. A great deal of legend and speculation has grown up in association with the Cerne Giant, but Piggott, in a recent study, has put forward a most convincing case for his identification with Hercules and his association with a fertility or Priapus worship revived by the Emperor Commodus towards the end of the second century A.D.

The Long Man of Wilmington, 231 ft. in height, has a staff in each hand: the figure is outlined by trenches defined by white-painted bricks, and is in the care of the Sussex Archaeological Trust. Nothing is known of its early hist., but there has been a great mass of conjecture, most of it quite fanciful.

The following may also be noted: The Westbury Horse on Bratton Down, Wiltshire, made in 1778 on the site of an older horse; Cherhill Horse on Marlborough Down, 1780; the new Horse at Pewsey to commemorate the Coronation, 1937; the Osmington Horse near Weymouth with its rider, usually identified as George III.

See Sir F. Petrie, *The Hill-figures of England* (occasional papers of the Royal Anthropol. Inst. No. 7), 1926; S. Piggott, *The Uffington White Horse in Antiquity*, vol. v., and *The Cerne Giant in Antiquity*, vols. vi., and xii.; M. Marples, *White Horses and other Hill-figures* (with bibliography), 1949.

**White Horse, Vale of the**, in Berkshire, England, see under WHITE HORSES AND HILL-FIGURES.

**White House**, official residence of the U.S. president, in Washington. It is built of freestone, in the Eng. Renaissance style, and constructed between 1792 and 1799. The original interior and part of the walls, were burned by Brit. troops during their occupation of the city in 1814. Early in 1949 it was discovered that the whole interior structure had become unsafe, and that a new building would have to be erected inside the old walls. The term 'White House' is also colloquial for the U.S. Gov.

**Whiteland**, see LEUCADIA.

**White Leg**, popular term for a condition in which the lower limb becomes white, swollen and painful as a result of thrombophlebitis in the veins, i.e. infection causing inflammation of their walls and clot formation in their cavities. W. L. is most commonly seen following childbirth, though it may also occur during convalescence from febrile diseases such as pneumonia and typhoid fever. The condition is a serious one, on account of the danger of blood clots becoming detached and passing to other parts (see EMBOLISM). Treatment consists of rest in bed with the limb supported on a pillow, fomentations, and attention to the general health.

**White Lead**, basic carbonate of lead, having the formula  $2PbCO_3 \cdot Pb(OH)_2$ . The compound is manufactured by sev. processes, the simplest of which consists in grinding litharge with water and sodium bi-carbonate. The Dutch process, by which the best quality W. L. is prepared, is carried out by placing spirals of sheet lead in pots at the bottom of which is vinegar, and covering with spent tan or dung for four or five weeks. The vinegar gradually evaporates through the heat generated by the tan and attacks the lead, forming a basic acetate. This is converted to W. L. by the action of the carbon dioxide evolved from the decaying tan. W. L. is a heavy powder, which is used as a pigment. Although very poisonous and liable to blacken in the presence of hydrogen sulphide, it is used extensively, as no substitute has been found which possesses the same covering power or 'body'.

**White Magic**, see under MAGIC.

**White Metal** (anti-friction metal), metallurgical term. It is applied either to the copper sulphide produced in the primary stages of obtaining blister copper from copper matte, or to the range of tin-base alloys used in engineering for manufacturing bearings. It is used for the lining of bearings, e.g. in locomotives.

**White Mountains**, range of mts. in New Hampshire (N.H.), U.S.A., especially the Presidential range in Coos co. (N.), forming a detached portion of the Appalachian system. A tableland, 10 to 15 m. broad, separates the two main groups, the East or White Mts. and the Franconia (with Lafayette Peak), Mt. Washington, the culminating peak, is over 6200 ft. high.

**White Nile**, see BAHR-EL-ABAD.

**White Pigments**, see PIGMENTS.

**White Plains**, co. seat of Westchester co., New York, U.S.A., 12 m. from New York City, on the Bronx R. It is a residential suburb of New York. Pop. 40,300.

**White River**, a riv. of Arkansas and Missouri, U.S.A., rising in N.W. Arkansas, running N.E. into S. Missouri, where it drains part of the Ozark plateau, and returning to Arkansas flows S.E. and S. to join the Mississippi. Total length about 800 m.

**White Russia** (**Byelorussian Soviet Socialist Republic**), European republic of the U.S.S.R. It was formed on Jan. 1, 1919. The W. part of the republic was ceded to Poland at the treaty of Riga in 1921, but in Nov. 1939 this ter. was reincorporated into W. R. when Poland was partitioned, and this position was confirmed under the Russo-Polish treaty in 1945. The republic has an area of 81,090 sq. m. There is no coastline. W. R. is bounded by the Ukrainian S.S.R. on the S., by the Lithuanian S.S.R. and Poland on the W., by the R.S.F.S.R. on the E. and W., and by Latvian S.S.R. and the R.S.F.S.R. on the N. The pop. is estimated at 10,368,000. Byelorussians form about 80 per cent of the pop., the rest being Russians, Ukrainians, Poles, and Jews. Minsk is the cap.

W. R. is watered by the Dnieper and Pripiet in the centre and S., and by the Dvina in the N. By comparison with the R.S.F.S.R., W. R. has a heavier rainfall and a more equable climate, being cooler in summer and much milder in winter. Much of the area is naturally covered with non-productive marsh and forest, but since the revolution of 1917 extensive drainage and forest-clearing projects have been carried out. In 1939 the republic was producing large quantities of grain, flax, hemp, and potatoes. Horses, cattle, sheep, and pigs are reared. There are deposits of rock-salt, and peat is worked. Between 1919 and 1940 many industries were developed in W. R.: Goulet produced agric. machinery of all types, and other industries were paper, matches, textiles, and leather works. These suffered heavily during the Second World War. By 1948 much industrial plant had been replaced. Communications were improved after the revolution, a notable achievement in this field being the construction of a network of navigable canals, the Dnieper-Bug canal being the most famous. Over a million pupils attend primary and secondary schools. The three institutions of univ. status are the White Russian State Univ., the Communist Univ., and the Agric. Academy.

W. R. was occupied by the Gers. in Aug. 1941; it was not entirely liberated until July 1944. For details of the fighting, see EASTERN FRONT, or RUSSO-GERMAN CAMPAIGNS IN THE SECOND WORLD WAR.

**Language and Literature.**—The White Russian language is a member of the Slavonic branch of languages (see under INDO-EUROPEAN LANGUAGES), spoken by c. 8,000,000 people, mainly living in the White Russian Soviet Republic. The hist. of the White Russian language began

in the fourteenth century, but only in the fifteenth century did it assume some importance. Francisk Skorna (b.c. 1490) was the earliest White Russian poet. It was already an official language of the Lithuanian kingdom, but under Poland and Tsarist Russia it was reduced to a dialect. After the First World War it became the official language of the White Russian Soviet Republic, and nowadays it is an important literary language. White Russian literature achieved a distinct form of its own in the sixteenth century. Its growth was hindered by the Russian Imperial authorities' dislike of minority cultures. The nineteenth century marked the rise of a school of White Russian poetry, deeply influenced by Polish lyricism and romanticism. W. Rovinski (1782-1810) and W. Dunin (1807-84) were its leading members. Later in the century White Russian poetry became more aggressively nationalist, but retained its characteristically dreamy nature.

**White Sea**, gulf of the Arctic Ocean, N. Russia. Its chief bays are Dvina (or Archangel) and Onega in the S., and Kandala in the N.W. Into it flow the rivs., Dvina, Onega, Vyg, and Mezen, and its chief port is Archangel. Herring, cod, and other fish are found. The sea is frozen over from Sept. to May.

**Whitethroat**, migratory bird of the genus *Sylvia*, classified among the Warblers. Two species occur in Britain, the *Sylvia communis*, and the *Sylvia curruca*. The *Sylvia communis* or greater W., is greyish-brown, with the wing-tips rather darker and the head ashy-grey, tail feathers dark greyish brown, under surface of the body white, and the breast, pinkish. It is a summer visitor and is found everywhere in England and Wales, Ireland, and over most of Scotland except the N. The general colour of the *Sylvia curruca* or lesser W., is rather greyer.

**White Vitriol**, see under ZINC.

**Whitford**, par. and vil. of Flintshire, Wales, 3 m. N.W. of Holywell. Its chief industries are iron works, limestone quarries, and agriculture. Pop. (estimated), 3,500.

**Whithorn**, royal burgh of Wigtownshire, Scotland, was the landing place of St. Ninian (q.v.), who built a monastery called 'Candida Casa' (397), in which he was buried (432), and which was long a place of pilgrimage. The priory was rebuilt in the twelfth century. Some ruins remain. Until the Reformation W. was the seat of the bishops of Galloway. Pop. 950.

**Whiting** (*Gadus merlangus*), one of the important European member of the cod family. It is abundant in shallow water round the coasts of Britain and Ireland, and extends into the Mediterranean. It is slender in form and, like the much larger hake, differs from most of the other species of the genus in the absence of a barbel. It makes rapid growth, but rarely exceeds 20 in. in length or two lb. in weight, and is commonly taken much smaller.

**Whiting**, see CHALK.

**Whiting-pout**, *see* **BIB.**

**Whitley Bay**, urb. dist. and seaside resort of Northumberland, England, on the N. Sea., 2 m. N. of Tynemouth. Pop. 32,000.

**Whitleyism**, or **Whitley Councils**, device for securing improved relations between employers and employed. It had its origin in 1916, when the gov. set up the Committee on Relations between Employers and Employed, known, from the name of its chairman, J. H. Whitley (1866-1935), as the 'Whitley Committee'. In one of its reports the Whitley Committee made recommendations regarding conciliation and arbitration which were embodied in the Industrial Courts Act, 1919. Later the committee recommended the formation of joint industrial councils of employers and employees for the consideration of a variety of questions. Labour representatives regarded these recommendations as an unsatisfactory compromise. With gov. approval, however, councils were brought into existence in many important industries and the principle was applied to the Civil Service and to local authorities. Subsequently, the Whitley Councils sank into the background. There were, however, some successful instances, notably in the flour-milling industry. During the Second World War similar bodies were set up, called joint production committees. *See also* **INDUSTRIAL RELATIONS**.

**Whitlow**, inflammation of the terminal phalanx of the finger, especially round the nail, due to infection by a micro-organism. Hot fomentations of boracic acid are efficacious, together with dressing of the inflamed surface with nitrate of mercury ointment. The W. should be opened by a doctor to allow the escape of pus.

**Whitman, Walt**, originally **Walter** (1818-92), Amer. poet, b. at West Hills, Long Is., of Eng. and Dutch descent. He was educated at public schools in Brooklyn and New York. His early career was very varied. He found an outlet for expressing his democratic sentiments by writing verse, which he pub. in 1855 under the title of *Leaves of Grass*. The metre he employed was entirely original. He discarded the conventional laws of feet and rhyme, and wrote in musical, rhythmic sentences of varied length. He was accused of indecency and immorality for his frankness in speaking of subjects usually tabooed, and the book was banned in Massachusetts in 1881, but was given the highest praise by Emerson and Thoreau. W. was an ardent abolitionist and lost an editorial post because of this. From 1863 to 1875 he was in Washington, first as war correspondent and later as a gov. clerk. He devoted all his spare time in visits to the hospitals where he acted as a volunteer nurse of the N. and S. alike. He also lost his position in the dept. of the interior because of objections there to poems in *Leaves of Grass*, but obtained another in the office of the attorney-general, which he held until he was partially paralysed in 1873.

The worth of *Leaves of Grass*, W.'s

masterpiece, was not fully acknowledged until after his death. Sometimes his disregard for the conventions of metre is obviously self-conscious and forced, and his poetry sinks into a string of names or adjectives. The controversies aroused during his lifetime, however, were largely due to his frank enjoyment of physical beauty, and physical love. His poetry reflected the conflicting moods of his impulsive, highly-emotional, and somewhat muddled personality, and, in some of its quieter, more wistful passages, with their skilfully spontaneous onomatopoeia, shows some of the characteristics of Verlaine's work. Histhrenodies on death have few equals in any language, and this is especially true of his poem on Lincoln, *When Lilacs Last in the Dooryard Bloomed*. His triumphant *Pioneers, O Pioneers* has become almost a national hymn. W.'s other works include, *Drum Taps* (1865), *Democratic Vistas* (1871), and *November Boughs* (1888). His autobiography was pub. in 1892. *See* lives by J. A. Symonds, 1906; B. de Schmeidt, 1913; E. L. Keller, 1921; C. Wells, and A. F. Goldsmith, 1922; J. Bailey, 1926; and G. Bullett, 1935.

**Whitney, Mount**, peak of the Sierra Nevada, S. California. It has an altitude of 11,195 ft. and is the highest peak in the U.S.A. proper.

**Whitstable**, urban dist. and seaside resort of Kent, England, on the Thames estuary, 6 m. N.W. of Canterbury, to which it is linked by one of Stephenson's earliest railways. It has famous oyster fisheries, and yacht building yards. Pop. 17,200.

**Whit Sunday**, or **Pentecost**, festival of the Christian Church celebrated on the seventh Sunday after Easter, to commemorate the descent of the Holy Ghost on the Apostles on the day of Pentecost (Acts ii. 1). Its name is probably an abbreviation of White Sunday, a name given to it on account of the white robes then worn by the newly baptised. The Festival of Whitsuntide corresponds with the Jewish Feast of Pentecost which commemorated the delivery of the Law on Mt. Sinai, fifty days after the Passover.

**Whitten-Brown, Sir Arthur** (1886-1948), Brit. admiral, b. in Glasgow. In the First World War he served in the R.F.C., and the R.A.F. In 1919 he made the first transatlantic flight with Sir John Alcock (q.v.), and was knighted later that year.

**Whittier, John Greenleaf** (1807-92) Amer. poet, b. at Haverhill, Massachusetts, son of a Quaker farmer. This Quaker poet was in part inspired by Burns, and some of his best poems are pictures of rural scenes. One of his best is *Snow-bound*, and equally famous in another strain is his searing poem *Ichabod* addressed to Daniel Webster, when the latter made a speech temporising with the S. slave power. His finest poetry is found in his lyrical, simple ballad-style descriptions of rural scenery and rural life. *See* lives by W. J. Lunt (1893), and S. T. Pickard (1895). *See also* A. Rowntree, *Crusader and Prophet*, 1946.

**Whittington, Richard** (d. 1423), Lord

Mayor of London, son of Sir William Whittington, a Gloucester knight. He was a London mercer, who held sev. municipal offices, and was thrice Lord Mayor of London (1397, 1406, and 1419).

**Whittington and Newbold, or Newbold and Dunstan**, par. of Derbyshire, England, 2 m. N. of Chesterfield, and incorporated in that tn.

**Whittle, Sir Frank** (b. 1907), Eng. inventor, b. at Leamington. He entered the R.A.F. as a boy apprentice and gained a cadetship to Cranwell college. While still a cadet he became interested in jet-propulsion, but received little encouragement until 1936, when he was placed on the special duties list. His first engine ran in the following year, and in 1941 it powered the Gloster E 28/39. He was knighted in 1948.

**Whittlesey, or Whittlesea**, mrkt tn. of Cambridgeshire, on the Nene, 5 m. E. of Peterborough. It has brick manufs. Pop. 8700.

**Whitwood**, par. of Yorkshire (W. Riding), England. It is a ward of the urb. dist. of Castleford, on the Calder, 4½ m. N.W. of Pontefract. Coal-mining is the chief industry.

**Whitworth**, urb. dist. of S.E. Lancashire, England. It has coal mines, stone quarries, felt works and cotton works, and cotton mills. Pop. 7400.

**Whitworth, Sir Joseph** (1803-87), Brit engineer, b. at Stockport. After serving his apprenticeship as a mechanic, he set up in 1833 as a toolmaker in Manchester, and made experiments in rifles, cannons, etc. The Whitworth rifle was invented in 1857, and was adopted by the National Rifle Association in 1860 and by the War Office in 1869. His development of standards for screw thread and gauge measurements was of great importance.

**Whitworth, Matthew**, see AVIMER, BARON.

**Whizzer, or Whizzing Stick**, see BULL-ROARER.

**Whooper**, see SWAN.

**Whooping-cough**, an infectious disease of childhood characterised by spasms of coughing, consisting of a violent expiration followed by a strong inspiration causing the 'whoop.' There is, however, no doubt about its infective nature, and efforts should be made to disinfect all expectoration in order to prevent the spread of the disease. In 1906 the causative organism, *Bacillus pertussis*, was isolated. W. is most common among children under five years of age, and it is to be regarded as a particularly dangerous disease, not only on account of the high rate of mortality, but because it is apt to leave an enfeebled state of the system, especially of the respirator. organs. The disease is ushered in by catarrhal symptoms which are not to be distinguished from an ordinary cold. In from one to two weeks the paroxysmal cough stage is entered upon. Each paroxysm lasts rather less than a minute; the coughs succeed each other rapidly and alternate with whooping inspirations. The paroxysm often ends with vomiting, after which the child appears exhausted but

free from pain. The paroxysmal stage may last from three to six weeks, after which there is a stage of decline. Possible complications are pneumonia, emphysema, hernia, cerebral hemorrhage, etc. The treatment consists of careful attention to the general health. Atropine has been found useful in relieving the spasm, though it has no effect on the duration of the disease. In warm weather the child should be allowed to go out, and during convalescence open-air treatment in a mild climate is beneficial. Active immunisation by means of a vaccine containing the dead bacteria is now used as a means of preventing W.; the inoculations are frequently combined with those for diphtheria. The most recent treatment, still in an experimental stage, consists of placing the patients in a decompression chamber where they are subjected to a reduced pressure (corresponding to an altitude of about 12,000 ft.), for 30 min. Since 1910 W. has been a notifiable disease in England and Wales, but not in Scotland.

**'Who's Who'**, Brit. biographical reference work founded in 1848 by Alfred Baily. The first ed. had 250 pages, and sold at half-a-crown. During the 45 years in which Baily pub. it there was little change in style or content, i.e. list of names of titled and official persons, with no biographical details beyond dates of birth and appointment.

In 1896 copyright and right of continuation in *Who's Who* were offered for sale by auction, and were secured for £30 by the publishers Adam and Charles Black. The new publishers announced that, what had been a handbook of the titled and official classes only, would now embrace all the most prominent persons in the kingdom. For this purpose a *questionnaire*, such as is still used, was devised and the entries written up from the answers. The 1897 ed. contained some 5000 biographies of most of the prominent persons in the kingdom; in later years the number was augmented to over 35,000.

**Whortleberry, or Huckleberry** (*Vaccinium myrtillus*), see BILBERRY, CRANBERRY.

**Whyalla**, tn. of S. Australia, on the western side of Spencer's Gulf, 250 m. from Adelaide by road. It is the shipping outlet for iron ore mined at Iron Knob, 3.5 m. inland, and has a blast furnace, and ship-yards; construction of a steel works was planned in 1949. The tn. obtains its water by pipe line from the R. Murray 223 m. away. Pop. 7700.

**Whympcr, Edward** (1840-1911), Eng. artist, author, and mountaineer, b. in London. He travelled among the Central and Western Alps (1860) to obtain sketches of Alpine scenery, and ascended Mont Pelvoux (1861). His ascent of the Pointe des Ecrins with a party (1864) was a remarkable mountaineering feat. W. also made the first ascent of the Aiguille Verte and in 1865 the famous first ascent of the Matterhorn (q.v.) by the N.E. ridge. W.'s successful ascent was his seventh attempt; during the descent four out of

the party of seven were killed. He next visited Greenland (1867, 1872), Ecuador and the Andes (1879-80), and Canada (1901-05). Among his works are: *Scramble among the Alps* (1871); *Ascent of the Matterhorn* (1871); *Chamonix and Mont Blanc and The Valley of Zermatt and the Matterhorn* (1897-1901). See life by F. S. Smythe, 1940, 1942.

**Wiborg**, Ger. for Vöhrum, (q.v.).

**Wichita**, co. seat of Sedgwick co., Kansas, U.S.A., the second city in the State, 210 m. S.W. of Kansas City. It stands in the centre of a farming and agric. dist., the chief product being wheat. The tn. is a milling centre. There are also oil refineries, packing estabs., motor vehicle works, foundries, and machine shops. The Friends Univ. is here. Pop. 115,000.

**Wichita Falls**, tn. of Wichita co., Texas, U.S.A., on the Wichita R., 95 m. N.W. of Fort Worth. It exports grain, and manufs. tanks, glass, mattresses, etc. There are oil wells in the neighbourhood. Pop. 45,100.

**Wick**, seaport, co. tn., and royal burgh of Cathness, in the extreme N. of Scotland, situated at the mouth of the little riv. of the same name. It has extensive herring fisheries and a good harbour. Shipbuilding and trade in cattle is carried on. The ruins of the castle, known as the Old Man of Wick, are a prominent landmark. Pop. 7300.

**Wicken Fen**, nature reserve in Cambridgeshire, England, acquired by the National Trust in 1928.

**Wickham Steed**, Henry, see STEED, HENRY WICKHAM.

**Wickliffe**, see WYCLIFFE.

**Wicklow** : 1. Maritime co. of Leinster, Ire, bounded on the N. by Dublin, S. by Wexford, E. by St. George's Channel, and W. by Carlow and Kildare. The co. is famous for its beautiful scenery. Running through the centre from N. to S. are the Wicklow Mts., with the heights of Lug naquilla (3039 ft.), Kippure (2473 ft.), and Duff Hill (2369 ft.), between which lie many fine gorges and valleys. The coast is a succession of steep cliffs and is dangerous for navigation; Wicklow Harbour is the only inlet of importance. The prin. rivs. are the Slaney and Avoca, the last named running through the Vale of Avoca and formed by the famous 'Meeting of the Waters' of the R's. Avonmore and Avonbeg, the Liffey, and the Vartry, the valley of the last containing the reservoirs of the Dublin waterworks. Granite is quarried in the W., and gold, copper, lead, and other minerals are found. Sheep and cattle are reared, and pasture occupies the greater part of the cultivated land. Oats and potatoes form the main crops. The chief tns are Wicklow (the co. tn.), Bray (7700), and Arklow (5000). The co. comprises eight baronies and returns three members to the Dail. In the Vale of Glendalough are the ruins of the 'seven churches'; there are other notable remains of eccles. buildings, and castles. The area is 500,250 ac. Pop. 60,300. 2. Seaport, market tn., and co. tn. of co. Wicklow, Ire, 31 m. S.E. of Dublin. Its chief importance is due

to the harbour, built to accommodate large vessels, with two fine piers. Trade is carried on in coal, timber, iron, and slate, which form the chief imports, while grain is the prin. export. There are large chemical works. There are ruins of a thirteenth-century monastery and part of the par. church dates from the Norman period. Pop. 3100.

**Wielie**, or Wickliffe, John, see WYCLIFFE.

**Widcombe-in-the-Moor**, vil. of Devon, England, on Dartmoor, 5½ m. from Ashburton. It is famous through the ballad *Widcombe Fair*. Pop. 700.

**Widendorp**, see NEUMUNSTER.

**Widgeon**, **Wigeon**, or *Marca penelope*, duck which visits Britain in winter, usually breeding further N. It is about 18 in. long. The plumage is grey and brown pencilled with black, the head and neck reddish-chestnut, the underparts white. Its flesh is valued for the table. The Amer. W. (*M. americana*) is a larger bird and has occasionally reached Britain.

**Widnes**, tn. and municipal bor. of Lancashire, England, on the Mersey, 12 m. E. of Liverpool. The W. Transporter Bridge across the Mersey links W. with Runcorn on the Cheshire side. The chief industries are chemicals, fertilisers, asbestos, cement, copper, and metal castings. W., with part of the rural dist. of Whiston, returns one member to Parliament. Pop. 46,110.

**Widow**, name given to a woman whose husband is deceased, who has not remarried. *Legal Rights*. On the death of her husband intestate, the W. takes absolutely (a) all the 'personal chattels', i.e. articles of household use or ornament, etc. (not used for business purposes), and (b) £1000 free of death duties and expenses. In addition, she is entitled to a life interest in all the residue (real and personal) unless there be surviving also a child or grandchild, when she takes one-half the residue for life (the other half going to children equally or grandchildren *per stirpes*). She is also entitled to the grant of letters of administration of his whole estate, though the court may in its discretion make the grant to the next-of-kin jointly (see also under SUCCESSION, INTERESTS). Where the husband's will does not make 'reasonable provision' for the W.'s maintenance she may apply under the Inheritance (Family Provision) Act, 1938, to the court for a maintenance order. No application can be made where the husband has bequeathed not less than two-thirds of the income of the net estate to the W. (See further under WILLS). See also JUS RELICTE, and SATI.

**Widow's Pensions**, see under NATIONAL INSURANCE ACT (1946).

**Wieck**, Clara Josephine, see SCHUMANN.

**Wieland**, Christopher Martin (1733-1813), Ger. poet, b. in Oberholzheim near Biberach in Württemberg. W. became a student at the univ. of Tübingen. He was of a religious, optimistic outlook, as seen in *Moralische Briefe in Versen*, and *Anti-Ödip*, obviously influenced by Klopstock. In 1759 he became a tutor in

Berne and in 1760 at Warthausen Castle near Biberach. Here he came into contact with Eng. and Fr. rococo; his novel, *Der Sieg der Natur über die Schwärmerer* (1764), ridiculed the romantic novels of his time. Then followed sev. important works: the educational novel *Agathon* (1766), the educational poem *Musarion, oder die Philosophie der Grazien* (1768), and trans. of twenty-two Shakespearean plays in prose (1762-66).

W. greatly influenced Goethe and Schiller, and the school of the later Ger. romantics. His work was the peak of Ger. rococo poetry. There is a good ed. of his works by H. Duntzer (1882), and by the Preussische Akademie der Wissenschaften (1909).

See W. Lenz, *Wielands Verhältnis zu Spenser, Pope und Swift*, 1903; V. Michel, *C. M. Wieland; la formation et l'évolution de son esprit jusqu'en 1772*, 1938, and M. Barthel, *Das Gespräch bei Wieland*, 1939.

**Wieland, Heinrich** (b. 1877), Ger. chemist, b. at Pforzheim. He studied at Munich, Berlin, and Stuttgart. From 1913 he was prof. of organic chemistry at Munich Univ., moving to the technical univ. there in 1917. From 1921 until 1925, he was on the faculty at Freiburg Univ. In 1925 he succeeded Willstätter at Munich. In 1927 he was awarded the Nobel Prize for chemistry for his research on biological oxidation.

**Wien, Wilhelm** (1864-1928), Ger. physicist, b. at Galken, E. Prussia, prof. of physics at Gießen, Würzburg, and Munich successively; he was awarded the Nobel prize in 1911. His chief work was in connection with radiation, in which branch of physics he discovered important relations between energy-density, wavelength, and absolute temp.

**Wiener-Neustadt**, tn. of Lower Austria, 30 m. S. of Vienna. The old castle (twelfth century) was converted into a military college (1752). W.-N. was frequently attacked from the air in the Second World War, being a railway junction, and producing small arms, locomotives, and fighter aircraft. There are some Gothic and baroque buildings, chiefly eccles. Pop. 29,000.

**Wieringen**, former Dutch is. in the N. waters of the auct. Zuider Zee. A dyke from about 1½ m., connecting W. with the main land to the West was the first step in the reclamation of the Zuider Zee. The enclosing dam of about 19 m. from the other end of W. to the E., was built in 1927-33. S. of W. the N. Western polder or Wieringenmeer was the first area of about 770 sq. m. to be converted into agric. land.

**Wiesbaden**, the cap. of the former duchy of Hesse-Nassau, Germany, on the N. slopes of the Taunus range, has sulphurous springs which have made it a world-famous spa. After the Second World War it became cap. of the Land of Hesse. Pop. 182,000.

**Wife**, see HUSBAND AND WIFE; MARRIAGE AND MARRIAGE LAW.

**Wig**, artificial head of hair. The use of Ws. is very old, and nothing is known of

their date of origin, though more details are known concerning particular styles of Ws. There is evidence in Ovid that the Rom. ladies wore blond wigs to enhance their charms. In France they appear to have been worn even before the Middle Ages. They were probably not common in England before the Tudor period, but thereafter became the height of fashion. It was only during the latter half of the eighteenth century that Ws. passed out of general use except for profession and medical purposes. Wigs are still worn in England by judges and barristers, and by the Speaker of the House of Commons during the exercise of their duties.

**Wigan**, mrkt. tn., parl., and municipal bor. of Lancashire, England, on the R. Douglas (which divides the tn. into two parts), 18 m. N.W. of Manchester. The most interesting of the older buildings is the magnificent, fourteenth-century par. church of All Saints', in the centre of the tn., in Early Perpendicular style. There is a Mining and Technical College, founded in 1857, and a grammar school. The Liverpool and Manchester canal passes through the tn.; the pier on this canal has attained some fame but its exact location is now disputed. W.'s industrial development is due to its position on the S.W. Lancashire coal field. Engineering and allied industries occupy an important place in the tn.'s industrial life. Machinery and equipment for use in Lancashire industries is produced. Other industries include artificial silk, bricks and drain pipes, oil and grease manuf., clothing, shoes and slippers, timber and saw-mills, breweries, chemicals, castings, vulcanite, printing and dyeing, gun-metal, steam fittings, and colliery requisites of all kinds.

Evidence exists of a Rom. settlement at W., and there was probably a Celtic settlement even earlier. W. developed gradually as a mrkt. tn. under the Normans. It bases its claim to be the oldest bor. in Lancashire upon a charter of incorporation given by Henry I. in 1100. But the first authentic record of W.'s corporate existence is the charter of 1246 granted by Henry III., which constituted the tn. a free bor. W. was royalist during the Civil wars. Coal was worked in W. from very early times, but the great coalfield was opened out in the latter part of the eighteenth century and the working of cotton on a large scale was also probably begun at this period. In 1888, W. became a co. bor. One member is returned to Parliament. Pop. 84,000.

**Wight**, Isle of, off the coast of Hampshire, in which co. it is included, in the Eng. Channel, separated from the mainland by the Solent and Spithead. It forms, however, a separate administrative co. returning one member to Parliament. Area 147 sq. m.; greatest length 23½ m.; greatest breadth 13 m. It has chalk cliffs and downs, the highest elevation being St. Boniface Down (787 ft.). Off the W. coast are the rocks known as the 'Needles.' The scenery of the I. of W. is picturesque, with its ravines or 'chines.' Yachting is a favourite sport in the is. and

Regatta Week at Cowes an outstanding ann. event. Agriculture and tourism are the chief industries; there is boat and shipbuilding, and sawmills. Important tns. are Newport (the cap.), Ryde, Shanklin, Ventnor, Cowes, Sandown, and Freshwater. It was the Rom. Vectis., and there are Rom. remains, including a villa at Brading. There is a castle at Carnbrook, and a Benedictine monastery at Quarr Abbey. Osborne House, 1 m. S.E. of Cowes was a favourite residence of Queen Victoria, and Tennyson's home at Farringdon still exists. Parkhurst Prison is on the I. of W. Pop. 91,000. See G. E. Mitton, *The Isle of Wight*, 1911; T. Varley, *Isle of Wight*, 1921; E. Burton, *England's Eden*, 1916; A. de Selincourt, *Isle of Wight*, 1918; and G. Church, *The Isle of Wight*, 1949.

**Wightman Cup**, lawn-tennis trophy. Mrs. George W. Wightman presented it in 1923, to be contested for annually, by Brit. and Amer. women amateurs.

**Wigston**, urb. dist. 4 m. S. of Leicester, England. Although it is in close proximity to the city of Leicester it is an entirely separate local gov. area consisting of residential and industrial dists. The urb. dist. comprises areas known as W. Magna, E. W., W. Fields, South W., and part of the par. of Glen Parva. It is an important railway centre. Pop. 14,900.

**Wigtown**, mkt. tn., royal and parl. burgh of Scotland cap. of Wigtownshire. Pop. 1100.

**Wigtown**, peninsular co. in the S.W. corner of Scotland. It is divided into three dists.: the Machars, or low country, lying between Wigtown and Luce Bay; the Rhynne, which comprehends the portion to the W. of a line drawn between Luce Bay and Loch Ryan; and the Moors, which includes the remainder. The climate is healthy, although the rainfall is considerable. Nowhere does the land rise to a great elevation and there are no considerable rvs. The Cree and the Bladenoch are both navigable for a certain distance. There are many old antiquities. In Whithorn (*q.v.*) is St. Ninian's Chapel. The prin. tns. are Stranraer, Wigtown, and Newton Stewart. The prin. occupation is agriculture. Area 311,609 ac. Pop. 29,300.

**Wigwam**, hut or cabin of N. Amer. Indians, which consists of a rough conical framework of poles stuck into the ground below and converging above, covered with bark, matting, or tanned hides.

**Wilamowitz-Möllendorf, Ulrich von** (1848-1931), Ger. classical scholar; b. at Markowitz, Posen. He was educated at Bonn and Berlin. He was prof. of classical philology at Greifswald, 1876; Göttingen, 1883, and Berlin, 1897. He was foremost among the learned men of his day in politics, religion, literature, and philosophy. See study by M. Pohlenz, 1932.

**Wilberforce, William** (1759-1833), Brit. reformer and philanthropist, b. at Hull and educated at Pocklington and at St. John's, Cambridge. He entered Parliament when twenty-one years old, and soon became friendly with the leading

statesmen of the day (especially with Wm. Pitt the Younger), with most of whom he corresponded. He was prominent in many philanthropic movements, but the great work of his life was in connection with the abolition of slavery, of which cause he assumed the leadership in 1787, though it was not until twenty years later that a Bill received the royal assent. See lives by R. and S. Wilberforce, 1838, and R. Compland (revised ed.), 1945; *Correspondence* (ed. R. and S. Wilberforce), 1846 and W. L. Mathieson, *British Slave Emancipation*, 1932.

**Wilcox, Ella Wheeler** (1850-1919), Amer. writer, b. at Johnson Centre, Wis. Her verses, mainly noticeable for their platitudes, were once accepted by a huge public in the U.S.A. and Great Britain as genuine poetry of a high order. Her *Collected Poems* were pub. in 1921.

**Wild Boar**, see **BOAR**, **WILD**.

**Wilbeesest**, see **GNU**.

**Wild, Frank** (1874-1939), Brit. naval officer and Antarctic explorer, b. at Skelton, Yorkshire. He was a descendant of Captain Cook, and served in Scott's Antarctic Expedition (1901); in Shackleton's Expedition (1907-09); in the Australian Antarctic Expedition (1911), and in 1921 he sailed with Shackleton for the Antarctic, and, after the latter's death at S. Georgia, assumed command of the *Quest*. He pub. *Shackleton's Last Voyage* (1923).

**Wilde, Oscar Fingall O'Flahertie Wills** (1856-1900), Irish dramatist and essayist, b. in Dublin. He studied at Trinity College, Dublin, and at Magdalen College, Oxford. W., a disciple of Pater, there founded an aesthetic cult, for advocating which he was parodied by W. S. Gilbert as Reginald Bunthorne in *Patience*. He won the Newdigate Prize in 1878. In 1882 W. went to America and lectured on aesthetic philosophy. He had already, in 1881, pub. a vol. of poems, which, in spite of affectations, attracted attention by their finish and the music of the verse. Seven years later he issued *The Happy Prince* (a fantasy) and *Other Tales*. *Lord Arthur Savile's Crime* and *other Stories*, and his only novel, *The Picture of Dorian Gray*, both appeared in 1891. *Dorian Gray* shows W.'s aestheticism in all its aspects: the search for intense or rare sensations, the ban put on every feeling and belief which sets a limit to the faculty of enjoyment, or captures the soul; the superiority of the true artist over the rules of society or morality. W. will ultimately be remembered chiefly as a dramatist. With the exception of *Salome* (1893), his successes were made in the realm of light comedy, where he could give full play to his fantastic wit. *Lady Windermere's Fan* (1892), *A Woman of No Importance* (1893), and *The Ideal Husband* (1895) were each and all successful, but his masterpiece was *The Importance of Being Earnest* (1895), which places him in the same rank with Goldsmith and Sheridan. His regard for literary style, gift of epigram, and rapier-like play of dialogue, produced a drama of brilliant extravagance; however, the

insincerity of his sentiments suggest an incurable cynicism. In 1895, following W.'s libel action against the marquess of Queensberry, who had accused him of perversion, he was convicted of immoral conduct and sentenced to two years' imprisonment. From 1897 until his death in obscurity and poverty in 1900, W. lived on the Continent, mainly in Paris. In his humiliation W. found the inspiration of the most powerful lines and of the only moving words which he ever wrote, in *The Ballad of Reading Gaol* (1898). *De Profundis*, pub. posthumously (1905) was a fragment of the letter which W. wrote to Lord Alfred Douglas in Reading Prison. The full text of this letter was first pub. in 1949, and it became clear that the document was more one of bitter recrimination than of apology, as it had appeared in the fragment first pub.

See lives and studies by A. Gide, 1905; A. Ransome, 1912; A. Symons, 1930; G. J. Renier, 1933; H. Pearson (3rd ed.), 1947. See also J. E. Agate, *Oscar Wilde and the Theatre*, 1947; H. Montgomery Hyde, *The Trials of Oscar Wilde*, 1948; Marquess of Queensberry and P. Colson, *Oscar Wilde and the Black Douglas*, 1949; G. Woodcock, *The Paradox of Oscar Wilde*, 1949; *De Profundis, The Complete Text* (with introduction by Vyvyan Holland), 1919.

**Wilder, Thornton Niven** (b. 1897), Amer. novelist and playwright, b. at Madison, Wisconsin, and educated in China, where his father was in the Amer. consular service, in California, and at the univs. of Yale, Princeton, and New York. From 1930 to 1936 he was on the faculty of Chicago Univ. His first novel, *The Cabala*, was pub. in 1925. In 1927 *The Bridge of San Luis Rey* appeared, which brought him international fame and for which he gained the Pulitzer Prize. His play, *Our Town*, won the Pulitzer Prize in 1938, and he won this prize for the third time in 1942 with another play, *The Skin of Our Teeth*. *The Ides of March*, a study of Caesar's downfall, told in letter-form, was pub. in 1948.

**Wilderness**, term applied to barren and desolate regions. It is used especially of an area S. of the Rapidan R., in Virginia U.S.A., 15 m. W. of Fredericksburg, where a battle of the Civil War was fought between Grant and Lee.

**Wildspitze**, peak in the Austrian Tyrol, in the Otztal group, 20 m. N.W. of Merano. It is 12,470 ft. high.

**Wildstrubel**, peak in the Bernese Alps, Switzerland, rising to 10,676 ft. It is near Leukerbad.

**Wilenski, Reginald Howard** (b. 1887), Eng. art critic, b. in London. He was educated at St. Paul's School and Balliol College, Oxford. He has occasioned much controversy over the works of both modern and the older schools of art. He was special lecturer in Manchester Univ., 1933-39, and is editor of the 'Faber Gallery' Art Books.

**Wilfrid, Saint** (d. 709), Eng. saint. He was a Northumbrian, b. at Ripon, and educated at Lindisfarne, according to the rule of the Celtic church, but later

whole-heartedly adopted the Rom. observances. W. travelled in Franco and Italy, and returned to Ripon to found an abbey under the Rom. observance. He was consecrated bishop of York at Compiègne in 664 and in the same year was the leading advocate of the Rom. view at the Synod of Whitby. See study by J. Fletcher, 1925.

**Wilhelmina, Helena Paulina Maria, Princess of the Netherlands** (b. 1880), daughter of King Willem III. and his second wife, Princess Emma von Waldeck-Pyrmont, b. at the Hague. In 1890, after the death of her father, W. succeeded him on the throne but under the regency of her mother until her majority. On Sept. 6, 1898, she was crowned at Amsterdam. Queen W.'s simple tastes, sincerity, and complete identification with and devotion to her people, made her beloved by all sections of the community. She married Hendrik Wladimir Albrecht Ernst, duke of Mecklenburg-Schwerin, on Feb. 7, 1901. Their only child, Princess Juliana Louisa Emma Maria Wilhelmina, was b. on April 30, 1909, and married Prince Bernhard von Lippe-Biesterfeld on Jan. 7, 1937. After the Ger. invasion in May 1940, Queen W. and her gov. went to London, and after the liberation of her country she returned with her daughter, who had been living in Canada. In 1948, when she felt that the gov. had been firmly re-established, and having ruled for half a century, she abdicated in favour of her daughter, who succeeded her as Queen Juliana on Sept. 6, while W. took over the title of Princess of the Netherlands. Queen Juliana and Prince Bernhard have four daughters: Beatrix (b. 1938), Irene (b. 1939), Margriet (b. 1943), and Maria, called Marijke (b. 1917).

**Wilhelmshaven**, tn., seaside resort, and former N. Sea base of the Ger. navy, in Hanover (Lower Saxony), Germany, on the N.W. shore of Jade Bay, 18 m. from Bremerhaven. The harbour was opened in 1869 and, until 1918, was Germany's chief naval base on the N. Sea, but after the First World War its fortifications were dismantled. Before the Second World War there was considerable restoration of the base by the Nazi gov., and W. again became Germany's chief N. Sea naval base. W. was the target of many mass assaults by the R.A.F. In Nov. 1948 the Royal Navy demolished the gigantic dry-dock, which was the greatest of its kind in Europe. After the close of hostilities, it was planned to make the tn. a small commercial port, relying on light industries, of which 150 had sprung up by the end of 1948. Pop. (1949), 100,000.

**Wilkes, John** (1727-97), Eng. political agitator, b. at Clerkenwell, London, and educated at Leyden Univ. He entered Parliament in 1757, and was later active in opposition to the Tory minister, Bute. He founded, in 1762, *The North Briton*, to which Charles Churchill was a valuable contributor, and in the following year was arrested for a libel uttered in the famous No. 45, in which he described the King's



speech as false. He was found guilty but pleaded privilege as a member of Parliament. He was expelled from Westminster in 1764, and went abroad for four years. After his return he was elected member for Middlesex by a large majority, but was expelled in 1769 for another libel. He was thrice returned for Middlesex on the strength of his enormous popularity, but was not allowed to sit until 1790. In 1774 he was elected Lord Mayor of London. W. was a debauchee and a political adventurer; but he had great constitutional importance, for his actions caused the collapse of the much-abused general warrant, gave the Press recognised entry to parl. debates, and estab. the right of an elected member to take his seat in spite of gov. attempts at exclusion. See J. Almon (ed.), *Wilkes' Correspondence*, 1905. See also lives by O. A. Sherrard, 1930; R. Postgate, 1930; and study in P. Quennell's *Four Portraits*, 1945.

**Wilkes-Barre**, city and co. seat of Luzerne co., Pennsylvania, on the Susquehanna R., in an anthracite coal-mining dist. It has iron and steel industries, cigar factories, silk and other textile mills, and railroad shops. Pop. 86,200.

**Wilkins, Sir George Hubert** (b. 1888), Australian explorer, naturalist, and aeronautical photographer; b. at Mt. Bryan E., S. Australia, and educated at the State School, and the Adelaide School of Mines. He served in the Australian Flying Corps in the First World War, and was official photographer, military hist. dept., 1917-18. W. commanded two Arctic expeditions, 1926-27 and 1928; led Antarctic expedition, 1928-29, and flew from Deception Island across Graham Land. He was commander of the *Nautilus* submarine expedition to the Arctic, 1931, and manager of the Ellsworth trans-Arctic expedition, 1933-39. W. was knighted in 1928. His works include, *Flying in the Arctic* (1928); *Undiscovered Australia* (1928); *Under the North Pole* (1931). See also ANTARCTIC OCEAN AND EXPLORATION and ARCTIC EXPLORATION.

**Wilkinson, Ellen Cicely** (1891-1947), Eng. politician, daughter of a cotton operative, b. in Manchester. She studied at Manchester Univ. She was Labour M.P. for Middlesbrough E. from 1924-31, and for Jarrow from 1935 till her death. In 1945 she was elected chairman of the Labour Party, and entered the first Attlee Cabinet as minister of education.

**Wilkinson, Norman** (b. 1878), Eng. painter, b. in Cambridge. He was educated at Berkhamstead School and St. Paul's Cathedral Choir School; was the originator of 'dazzle paintings', used for the protection of merchant ships in the First World War, and became Adviser on Camouflage to the Air Ministry 1938-42.

**Will**, term sometimes used in psychology synonymously with conation to cover all activity, desiring, and striving. It then stands for one of the three traditional aspects of mind: feeling, knowing, and conation. More commonly it is used in a more restricted sense, which is also closer to the usage of ordinary speech, to stand

for the mind's control of its conative impulses. Many psychologists believe that W. in this sense is illusory; that in all cases it is the strongest impulse that wins. W. James thought that the appearance of control of impulse arose only from the fact that in apparently willed activity use is made of the law of ideomotor action by which an impulse is carried into action as a result of the mind paying concentrated attention to it: this puts the difficulty only one step further back since W. must be supposed to be effective in changing the train of ideas, if not in affecting action directly. There seems sufficient reason for affirming that although there are impulses, desires, etc., which tend to drive us in certain directions, we also have a capacity for resisting those impulses and of making a choice between them.

See DETERMINISM; PSYCHOLOGY; CALVIN, JOHN; DESCARTES, RENÉ; HOBBS, THOMAS, and HUME, DAVID. See W. James, *Principles of Psychology* (2 vols.), 1907, and G. F. Stout, *Manual of Psychology*, 1921.

**Will and Testament**, see NUNCUPATIVE WILL; WILLS AND TESTAMENTS.

**Willamette**, riv. of Oregon, U.S.A. It is formed by the fusion of the McKenzie Fork and Middle Fork Rs., and joins the Columbia R. near Portland. It is nearly 260 m. in length.

**Willcocks, Sir William** (1852-1932), Brit. engineer, b. in India and educated at Roorkee College, India. He was attached to the Indian Public Works, 1872-83; and to the Egyptian Public Works, 1883-97. W. projected and designed the Aswān Dam, 1898. K.C.M.G., 1902. His most important work was the irrigation of over 3 million ac. in Mesopotamia begun in 1911.

**Willebrod, Saint**, see WILLABROD.

**Willebroek**, tn. in Belgium, 12 m. S. of Antwerp, on the maritime canal from the Rupel to Brussels. It has important paper-mills, engineering workshops, bleacheries, distilleries, salt-works, and manufs. of furniture and chemicals. Pop. 14,700.

**Willemstad**, city, port, and cap. of the Netherlands W. Indian Terr., and of the is. of Curacao, and noted for its quaint seventeenth-century Dutch gabled houses. W. has one of the finest harbours in the Caribbean. It has the second largest oil refinery in the world, estab. in 1925. Pop. 40,000.

**Willenhall**, tn. of S. Staffordshire, England, situated between Walsall and Wolverhampton, about 3 m. from each. W. stands on a coal-field and coal was dug in the sixteenth century. About the same time the manuf. of locks and bolts, still the main industry, was carried on. Pop. 30,700.

**Willesden**, bor. of Middlesex, England, 7 m. from St. Paul's, London, 1 m. from W. Junction. It includes Brondesbury, Cricklewood, Harlesden, Kensal Rise, Neasden, Kilburn, and Stonebridge. The par. church of S. Mary's has Norman remains. The bor. returns two members of Parliament. Pop. 185,000.

**Willett, William**, *see under* DAYLIGHT SAYING.

**William I.**, surnamed **The Conqueror** (1027-87), king of England, natural son of Robert I., duke of Normandy (*see* ROBERT I.). He succeeded at the age of seven to the duchy of Normandy and to the suzerainty of Brittany, with claims to Maine and the Fr. Vexin (*q.v.*). In 1053 he consolidated his hold on Normandy by his marriage to Matilda, daughter of Baldwin, count of Flanders (*see* BALDWIN, *Baldwin IV*). In 1063 W. invaded Maine and adopted the title of count of Maine. In 1064 he conquered Brittany by his victory at Dinan. W. visited Edward the Confessor in 1051 when it seems he was recognised by the latter as his heir. It is traditionally averred that in 1064 Harold promised to support W.'s claim to the Eng. throne on the death of Edward the Confessor. But in 1066 Harold ascended the throne. W. then invaded England, landing at Pevensey near Hastings with a force which has been estimated at about 10,000 men (including 2000 mounted knights) on Sept. 28, and on the following Oct. 14 met and defeated H.'s army at a place since called Battle in which Harold was killed. W.'s claim to the throne was by contemporary views fairly sound. He claimed not to have conquered the Eng. but to have defeated a usurper; and he acknowledged the validity of Eng. laws and customs and claimed no prerogative not exercised previously by Eng. kings. By an economic blockade W. secured the surrender of London, and was crowned by Kadred in Westminster Abbey (Dec. 25). In March 1067 he returned to Normandy leaving his half-brother Odo of Bayeux and Wm. FitzOsbern as regents. The consequences were a series of rebellions by the barons beginning in the autumn of the year and continuing till 1072, when the last of them was ruthlessly quelled. By this date all Eng. and foreign resistance to W. had also been crushed. In the process, W. ravaged the lands between the Tyne and the Ouse leaving a trail of desolation, especially in Yorkshire.

Some historians have represented the Conquest as an almost entirely destructive *coup de main*, organised by a tyrannous governing clique imbued with alien traditions and intent on the extirpation of the Anglo-Saxon culture and institutions. This, however, is an oversimplification of the question. While modern historians no longer underestimate the great achievements of A.-S. England, nor the suffering which the Conquest must have occasioned, W.'s policy proved, in the main, to be ultimately beneficial. He brought England within the European system, gave it a gov., an administrative system, and an army, and at the same time a reformed Church subject to the discipline of the common law. (D. Jerrold, *England, Past, Present, and Future*, 1950).

Under W. a system of dependent military tenure became the normal form of tenure. Anglo-Saxon England had not been

feudal. Though the process by which the land was granted by W. is not known, the outcome of the process is set forth in detail in the survey which is known as Domesday Book (*q.v.*). In the grant of fiefs to his supporters W. kept about one-fourth of the land of England for himself and the immediate effect of his feudal settlement was greatly to enhance the power of the Crown. In Sept. 1086 W. left England for the last time, and on Sept. 9, 1087, he *d.* from wounds received at the siege of Mantes.

*See also* HAROLD, NORMAN CONQUEST, THE; ROBERT II. *See* H. W. C. Davis, *England under the Normans and Angevins*, 1919; F. M. Stenton, *William the Conqueror*, 1925; D. Douglas, *The Norman Conquest*, 1928; F. M. Stenton, *English Feudalism 1066-1166*, 1932; P. Orton, *Outlines of Medieval History*, 1933; R. H. Hodgkin, *A History of the Anglo-Saxons*, 1940; and F. M. Stenton, *Anglo-Saxon England* (Oxford History of England series), 1945.

**William II.**, commonly known as **William Rufus** (*c.* 1056-1100), king of England, second son of William I. He succeeded to the Eng. throne on the death of his father, his elder brother, Robert, being duke of Normandy. In 1090 W. acquired E. Normandy and Fécamp from Robert; his intervention in Scottish affairs met with mixed success, but in 1092 he secured the annexation of Cumberland and Westmorland to the Eng. Crown. The last years of W.'s reign were spent in inconclusive wars with the king of France and the count of Touraine. Much of W.'s reign was occupied in disputes with the Church, which became intense after Anselm's (*q.v.*) appointment to Canterbury. W.'s policy has received much criticism from monastic chroniclers; he was grasping, tyrannical, and apparently irreligious, but in fact he was merely following, though with less *finesse* and fewer scruples, the policy of his father. He was killed by an arrow while hunting in the New Forest. *See also under* ANSELM. *See* E. A. Freeman, *The Reign of Rufus*, 1882; Z. N. Brooke, *The English Church and the Papacy*, 1931.

**William III.** (1650-1702), king of England, Scotland, and Ireland, and stadtholder of Holland, was the posthumous son of William II., Prince of Orange, and Mary, Princess Royal of England, daughter of Charles I. *b.* at the Hague. The de Witt party was in the ascendancy during his childhood, but in 1672, W.'s supporters murdered the de Witts. At twenty-two he was appointed captain-general of the Dutch forces and, not long after, stadtholder. He was in the main responsible for the direction of the war against France. Perhaps the most far-reaching event of his life was his marriage, in 1677, to Mary, daughter of James, duke of York, afterwards James II. of England. This was the triumph of Danby and W. over Louis XIV. W. cultivated the growing opposition to James II., and when eventually overtures were made to him to invade England, he accepted them,

and landed with a small force at Torbay, on Nov. 5, 1688. He was crowned joint sovereign with Mary in April 1689. In the following year he defeated James II. at the Battle of the Boyne, and, having conquered Ireland, proceeded to subdue Scotland. He went to Holland in 1693 and commanded the Dutch army. The peace of Ryswick (1697) was W.'s greatest diplomatic achievement. W. was a generally unpopular, though respected king. His reserve, his treatment of his wife, his Dutch favourites and his obvious use



WILLIAM III

Engraving after a picture by Netscher

of England primarily as an instrument for saving Holland from France alienated Eng. affection. His treatment of the Whig party was skilful : though he in fact owed his throne to them he managed to establish himself securely enough to rule independently, and often in opposition to their views. He was hated by the Irish Catholics, who held the treaty of Limerick treacherous, and to a number of the Scots his name was associated mainly with the massacre of Glencoe. His real greatness lies in his struggle against Louis XIV. See lives by H. D. Traill, and G. J. Reimer, 1888, 1932 ; G. Burnet, *History of My Own Times* (1897 ed.), M. C. Trevelyan, *William III. and the Defence of Holland*, 1930 ; and G. M. Trevelyan, *The English Revolution*, 1688, 1939.

**William IV.** (1765-1837), king of Great Britain and Ireland, was the third son of George III., *b.* at Buckingham Palace. He went to sea in 1780, and in five years was promoted captain. He was created duke of Clarence in 1789. Shortly after this he became the lover of the actress, Dorothea Jordan (*q.v.*). In the interests of the royal succession he married in 1818

Adelaide, eldest daughter of George, duke of Saxe-Coburg-Meiningen, but none of their children survived infancy. He was appointed Lord High Admiral in 1827 and three years later, on the death of George IV., succeeded to the throne. He was boisterous, tactless, but good-hearted, and occasionally as king showed unexpectedly sound common sense, as in his handling of the constitutional crisis, 1830-32. See lives by P. Fitzgerald, 1884, and G. E. Thompson, 1932.

**William I.** (1797-1888), king of Prussia, and emperor of Germany, *b.* in Berlin. He was in large part responsible for the absolutist and autocratic ideas which pervaded the rule of the imperial house of Germany. He found in Bismarck a minister anxious to govern according to his own view, and it may be said that between them they had a large part in the making of Germany as it was before 1914. During the Franco-Prussia War W. commanded the Prussian army and led his soldiers to the victories of Gravelotte and Sedan. He was proclaimed emperor of Germany in the Palace of Versailles on Jan. 18, 1871. See life by A. Forbes, 1888 ; see also E. Simon, *The Emperor William and his Reign*, Eng. trans. 1886 ; P. Wiegler, *William the First*, Eng. trans. 1929.

**William II.** (Friedrich Wilhelm Victor Albrecht) (1859-1941), Ger. emperor and king of Prussia ; *b.* in Berlin ; eldest son of the Crown Prince Frederick (afterwards Frederick III.) and of Victoria, Princess Royal of Great Britain, and grandson of William I.

He received a military training, and in 1885 had risen to the rank of colonel in the Hussars of the Guard. He married the Princess Auguste Viktoria of Schleswig-Holstein. On the death of his father he succeeded as ninth king of Prussia and third Ger. emperor, June 15, 1888. His first action after accession was to pay a round of visits to European countries, including those that had recently been hostile to Prussia. His obvious intention of reducing the chancellor to a mere instrument of his own will led to Bismarck's resignation on March 20, 1890. W.'s chief ambition was to strengthen Germany's power in Europe by colonial expansion. Too much has been made perhaps of his responsibility for the catastrophic failure of Germany's foreign policy or for the tremendous development of her internal prosperity and her position as a Great Power, for in many respects he acted as a constitutional sovereign, and the blunders of his ministers were not his.

In his strenuous endeavours to widen Ger. influence, he visited Abdul-Hamid at Constantinople in 1889 and 1898 ; and, while maintaining the Triple Alliance (*q.v.*), he tried for some years to cement a friendship with Russia. He was a frequent and welcome visitor to England until 1895. Eng. people resented his congratulatory telegram to President Kruger after the Jameson Raid 1896. Relations of Germany with Britain had improved by 1907 ; but an interview W. granted to the *Daily Telegraph* in 1908,

concerning naval co-operation, caused him trouble with his own subjects, and for a while he showed more reticence.

W. was at Kiel regatta on June 28, 1914, when news of the Sarajevo assassination reached him. Probably he personally did not desire, at this stage, anything more than a short, localised war. But he pushed on with war preparations so openly, and showed such complete disregard of the most solemn international agreements, that Russia, France, and Great Britain were soon irrevocably committed, and a world conflict was inevitable. This had been the aim of the extreme militarists in Germany, and W. thus played entirely into their hands. At first he directed operations and selected the leaders; but after a few months he was virtually subordinate to Hindenburg and Ludendorff. *See also* WORLD WAR, FIRST.

On Oct. 3, 1918, when defeat of the Ger. forces was imminent, he appointed Prince Max of Baden to the chancellorship. In Nov. Prince Max demanded his abdication, and announced it as a fact on the 9th. He thenceforth resided at Doorn Castle in Holland. There was at first talk, especially in England, of bringing him to trial; but, as the peace-temper revived, the idea of holding him individually responsible for the war took on an aspect of absurdity that killed the project. *See* Lives by E. Ludwig, 1926, and M. Muret, 1940.

**William le Clito**, *see under* ROBERT II (CURTHOSE).

**William of Durham**, *see under* UNIVERSITY COLLEGE.

**William of Jumièges**, *see* JUMIEGES.

**William of Malmesbury** (c. 1095-1113), Anglo-Norman chronicler. He became a monk in the monastery at Malmesbury and inter-librarian and precentor. His *De Gestis Regum Anglorum* (A.D. 449-1127), gives the hist. of the kings of England from the Saxon invasion to 1127.

**William of Orange**: (1533-84), *see* WILLIAM THE SILENT. (1650-1702), *see* WILLIAM III.

**William of Ockham**, *see* OCKHAM. WILLIAM OF.

**William of Wykeham**, *see* WYKEHAM. WILLIAM OF.

**William the Lion** (1143-1214), king of Scotland. He succeeded his brother in 1165. He was the grandson of David I. W. made an alliance with France against England in 1168. In 1174 he invaded England in alliance with Henry's own sons, was defeated at Alnwick, and sent as a prisoner to Falaise in Normandy. By the treaty of Falaise he was liberated, but he agreed to do homage to Henry for Scotland and all his other terts. He returned to Scotland in 1176, founded a monastery at Arbroath, 1178, and made the Church of Scotland independent of that of England. By the treaty of Canterbury between him and Richard I. the independence of Scotland was recognised on payment of 10,000 marks.

**William the Silent, Prince of Orange** (1533-84), soldier, statesman, and founder of the Dutch republic, the eldest son of

William, count of Nassau, was b. at Dillenburg in Nassau. In 1544 he succeeded a cousin in the principality of Orange and estates in Flanders and Holland, and before he was twenty-one Charles V. appointed him general-in-chief of the army and stadtholder of Holland, Utrecht, and Zeeland. In 1567 he was head of the national rising against Sp. persecution, and openly embraced Protestantism. He was at first defeated by Alva, largely through want of means, but in 1579 he estab. the union of the seven northern provs. He was assassinated by Balthazar Gérard, an agent of Philip II. *See* J. L. Motley, *Rise of the Dutch Republic* 1856 (reprinted in Everyman's Library); *Cambridge Modern History* (vol. III., (1904). *See also* lives by F. Harrison (1897), Ruth Putnam (1911), and C. V. Wedgwood, (1914).

**Williams, Sir George** (1821-1905), *see* YOUNG MEN'S CHRISTIAN ASSOCIATION.

**Williams, John** (1796-1839), Eng. missionary, b. at High Cross, Tottenham, Eng. In 1816 he offered himself to The Missionary Society (now London Missionary Society) and was appointed to the S. Seas. He was given charge of the is. of Rarotonga in the Society Group, but his restless activity led him to explore further Polynesian is. He voyaged among the Cook Is. Stranded on the is. of Rarotonga, he built *Messenger of Peace*, in which he explored the S. seas for ten years, opening up the Samoan is. to Christian missions. In Nov. 1839, he left to visit the cannibalistic New Hebrides, and on the is. of Erromanga he was murdered. *See* life by B. Mathews, 1935.

**Williams, Ralph Vaughan**, *see* VAUGHAN WILLIAMS.

**Williams, Roger** (c. 1600-83), founder of Rhode Is., U.S.A. *See* RHODE ISLAND.

**Williamsburg**, city and co. seat of James City co., Virginia, 48 m. S.E. of Richmond; it contains the Wm. and Mary College (1693), and E. State Lunatic Asylum (1769). It was the first cap. of Virginia. Through the munificence of J. D. Rockefeller, Jr., it has been uniquely restored to its former condition of 300 years ago. It has fisheries and manufs. lumber and woollen goods. Pop. 3900. *See* W. Tyler, *The Old Colonial Capital*, 1909.

**Williamson, James**, *see* ASHTON, BARON.

**Williamsport**, city and co. seat of Lycoming co., Pennsylvania, U.S.A. It is a well-built and imposing tn., standing in a pleasant country. It has manufs. of lumber, cars, motors, steel and iron goods, textiles, etc. Pop. 41,300.

**Williamstown**, city of Victoria, Australia, on the shore of Hobson's Bay. The distance from Melbourne by rail is 9½ m., but a steam ferry across the R. Yarra reduces the distance to 4½ m. It is the centre of a busy dock area and the site of engineering and other factories. Pop. (estimated) 27,000.

**Willibald or Willebald, Saint** (c. 700-786), Eng. saint and missionary, b. in Wessex, a cousin of St. Boniface. He was offered as an oblate at the age of five, and later took vows in that monastery at Waltham. Later he went on pilgrimage

to Rome and Palestine and studied at Monte Cassino. He was sent to Germany by the pope to help Boniface, and by the latter was consecrated bishop of Eichstätt.

**Willibrord** (or **Willebrod**), **Saint** (c. 657-739), Eng. saint and missionary, b. in Northumbria. He was educated in a monastery at Ripon, and sailed with twelve companions to Frisia (690), making many converts. Following diplomatic negotiations with Pepin, Pope Sergius I. consecrated W. archbishop and W. then estab. his metropolitan cathedral at Utrecht, and founded a monastery at Echternach. He is regarded as the apostle of Christianity in the Netherlands.

**Willington, Freeman Freeman-Thomas**, first **Marquess** of (1866-1941), Brit. administrator, educated at Eton and Trinity College, Cambridge. He entered Parliament as Liberal member for Hastings in 1900; for Bodmin in 1906. He was junior lord of the treasury from 1905 to 1912 and was raised to the peerage in 1910. W. received the G.C.S.I. in 1924 and was raised to a viscountcy. He succeeded Lord Byng as governor-general of Canada, 1926. He received G.C.M.G., 1926, and succeeded Lord Irwin as viceroy of India in 1931. During his first year of office he induced Gandhi to visit London for the Second Round Table Conference (see **INDIA—History**), and dealt firmly with the civil disobedience movement, 1932-34. He was created marquess in 1936, when he relinquished his vicerealty.

**Willis's Rooms**, see **ALMACK'S**.

**Willington**, tn. of Durham, England, on the Wear, with Crook, 4 m. from Bishop Auckland. It is included in the Crook and Willington urb. area. It is a coal-mining centre. Pop. (estimated) 6700.

**Willkie, Wendell** (1892-1944), Amer. politician, lawyer, and businessman, b. at Elwood, Indiana, of Ger. stock. He was educated at a local school in Elwood and, afterwards, at Indiana Univ.; studied law at Oberlin College. He was called to the Ohio Bar 1919. In 1924 he became a member of the Bar of New York City, and in 1933 was appointed president of the Southern and Commonwealth Corporation. W. embarked on a long struggle against Roosevelt's New Deal policy, notably in relation to the Tennessee Valley Authority (*q.v.*). In 1940 he was the Republican candidate for the presidency of the U.S.A., when Roosevelt was elected for his third term.

He consistently supported Gr. Britain and encouraged the Amer. war effort. He visited England in 1940 and on his return gave evidence in favour of the Lend-Lease Bill, and urged the repeal of the Neutrality Act. In Aug. 1942 he set out for the Near E. Russia, and China, as a special representative of the U.S.A., appointed by Roosevelt.

**Will-o'-the-Wisp**, see **IGNIS FATUUS**.

**Willoughby, De Eresby**, see **BERTIE, PEREGRINE**.

**Willow**, name given to those members of the genus *Salix*, which are not willows. They grow readily on damp soil and the Huntingdon or white W. grows rapidly to a height of 70 or 80 ft., and is a useful

timber tree, as, too, is the Bedford or Russell's W. The white W. (*S. alba*) is an elegant tree with lanceolate leaves, silvery with hairs on the lower side. This, and its variety, *cærulea*, yield the tough resilient wood from which cricket-bats are made. It originated in Norfolk, England. The bay willow (*S. pentandra*) has dark-green, glossy oval-shaped leaves, which are sticky to the touch and fragrant like the poplar. *S. babylonica*, the weeping W., is a native of China. The crack W. or withy (*S. fragilis*) with narrow pointed leaves, grows as a large tree with a rounded open crown. Its name is due to the ease with which the twigs snap off at the base. The osier (*S. riminulus*), also with narrow leaves, is the species chiefly used in basket-making. The flowers of the W. are borne on catkins, which appear before the leaves. Male and female catkins grow on separate trees, and cross-pollination is effected by insects and the wind.

**Willow Herb, French Willow, or Rose-bay** (*Epilobium angustifolium*). Perennial herb of the family *Compositae*. The stems, which are entrenched, have lanceolate leaves and terminate in a long spray of rosy or purple flowers.

**Willow Pattern Ware**, chinaware with an elaborate design in imitation of the original blue china of Nanking. It was introduced into Eng. porcelain in the late eighteenth century by Thomas Turner of Caughley, Shropshire.

**Willow Wren**, see **WARBLERS**.

**Wills and Testaments**. The power of making a will or testament of personal property (see **PERSONALITY**; **PERSONAL PROPERTY**) has existed in England from very early times, but for centuries the common law and feudal archaisms operated to prohibit the disposition of land by will, and the power to make a will of lands was only acquired through the equitable doctrine of uses and trusts after much legislation and considerable conflict between the courts of common law and equity (see **LAND LAWS**; **USES**). At common law a will might be nuncupative (see **NUNCUPATIVE WILL**), but at the present day the combined effect of the restrictions as to oral wills and testaments, and the requirements of the Wills Act, 1837, is to make it essential in practically every case to employ writing. Most wills, including codicils (*q.v.*), to be valid must be signed at the end of the will by the testator, or some other person in his presence, and by his direction, and such signature must be either made or acknowledged by the testator in the presence of the last two witnesses present at the same time, and such witnesses must attest the will in the presence of the testator. Any instrument executed in the above manner may take effect as a will, provided the intention was that it should not operate till after the death of the donor; and again, a duly executed instrument, described as instructions for a will, may have effect as such, if it is apparent that it was intended to take effect in the absence of a more formal instrument. Any alteration in a will, made after its execution,

must itself be executed in the same way as a will, but an alteration is sufficiently executed if the testator and the witnesses sign their names in the margin, or in some place opposite, or close to, the alteration; or sign a memorandum at the end of the will referring to the alteration. Alterations not duly executed can, however, be validated by a codicil, confirming the will (*see also* EVIDENCE). A will is in all cases revocable, even though the testator may expressly declare it to be irrevocable. Every will is now construed with reference to the estate, real or personal, comprised in it, to 'speak from death' or, in other words, to take effect as if it had been executed immediately before the death of the testator, unless a contrary intention appears by the will; which last words, however, only relate to the question of *what* property passes by the instrument, and do not mean that whatever the testator says in his will is to be interpreted as if the will were made on the day of his death. As regards personal property there is no restriction as to what a person may bequeath by his will, whether his interest in such property be one that is then actually vested, or only contingent or executory; and a person may validly dispose of property acquired subsequently to the making of his will. As regards land it is to be noted that the restrictions on testamentary disposition are only such as arise from the limitations of the particular subject-matter (*see* ESTATE; LIMITATION OF ESTATES; LAND LAWS; and SETTLEMENTS); there is nothing to prevent a person from devising land to which he is absolutely entitled in fee simple; but of course if he have no more than a freehold interest for his own life he will have nothing to dispose of at his death in default of some power of appointment vested in him (*see* POWER). Every person of sane mind, except an infant (*q.v.*), can make a valid will (including servicemen of any age, *see infra*); and every person of age can be an attesting witness, including a creditor, or an executor, but where the will purports to make a gift to the spouse of an attesting witness, the attestation is good, but the gift void. A will is revoked by a subsequent will or codicil; or by a written declaratory of an intention to revoke and duly executed like a will; or by destruction, burning, tearing, cancellation, etc., provided there was an intention to revoke by such destruction, etc., or by marriage of the testator, subsequent to the date of the will (this does not apply to wills made in exercise of a power of appointment). The only way to revive a revoked will is to re-execute it, or to make a codicil showing an intention to revive it. By Lord Kingsdown's Act, no will or testament shall be held to be revoked or to have become invalid, nor shall its construction be in any way altered, by reason of any subsequent change of domicile (*q.v.*) of the person making the same. Where a beneficiary under a will predeceases the testator, the gift lapses except in certain cases (*see* LAPSE). A bequest or devise to two or more persons

by name or by a general description of them as a class (*e.g.* 'the nephews of X') is construed as a joint gift (*see also* JOINT TENANCY), and where any of the joint donees predecease the testator, their shares go to the surviving joint donees. On the other hand the donees will take 'in common' (*see* COMMON, TENANCY IN) if the testator has used words implying separate interests (*e.g.* 'equally,' or 'among'). But a gift to a class, even though as tenants in common, *e.g.* a bequest of '£10,000 to the children of X in equal shares,' will be construed as a gift to such of the children of X as shall be living at the death of the testator, and the predecease of any one of them does not cause a lapse.

A person, as noted above, must be of sound mind if his will is to be valid. The Inheritance (Family Provision) Act, 1938, empowers the High Court to order maintenance out of the testator's estate for the benefit of certain 'dependants,' viz. a surviving wife or husband, an infant son or son under disability, or an unmarried (or invalid) daughter. Such order may be made if the will does not make 'reasonable provision' for the maintenance of the dependant who applies to the court. No application can be made where the testator has bequeathed not less than two-thirds of the income of the net estate to a surviving spouse and the only other dependant(s) is (or are) children of the surviving person. An application must be made within six months of probate. Since the object of the Act is to provide maintenance for dependants, an application is not likely to be successful where the estate is very small. Where the value of the net estate does not exceed £2000 the court has power to make an order providing for maintenance in whole or in part by way of payment of capital.

By an Act which was passed in 1918 removing doubts on the construction of section 11 of the Wills Act, 1837, it was affirmed that the Act of 1837 always has authorised that any soldier being in actual military service, or any mariner or seaman being at sea, may dispose of his personal estate as he might have done before 1918, i.e. free from the formalities, such as they are, prescribed by the Act of 1837—though under the age of twenty-one. Section 11 of the Act of 1837 is, however, extended by the Act of 1918 to any member of the naval or marine forces, not only when at sea but when so circumstanced that, if he were a soldier, he would be in actual military service. The Act of 1918 (section 5) extends the meaning of 'soldier' to a member of the air force. Further, a disposition of real property, by a 'soldier' is valid though not in legal form and though the testator was under twenty-one. The legal immunities as to formalities would seem to apply also to women's services, for precedents show that a woman has been regarded as a seaman or a mariner for these purposes, while other decisions have included a seaman-typist, a nurse in a hospital ship, and, in the 1939-45 War, a W.A.A.F.

Though a will is not required by law to be made in any particular form, more or less common forms have been evolved in process of time. The Law of Property Act, 1925, provides that the Lord Chancellor may prescribe forms to which a testator may refer in his will, but that unless so referred to, such forms are not to be deemed incorporated in a will. Such an Order has already been made under that provision (Statutory Will Forms, 1925; Statutory Rules and Orders, 1925, No. 780).

*Scots law of wills.*—A domiciled Scotsman cannot, in certain circumstances, dispose of the entirety of his estate. If he leave a widow and children, the widow is entitled to one-third share in the whole of the moveable estate (see *JUS RELECTÆ*), and the children to another third (see *LEGITIM*). If he leave a widow but no children, or children but no widow, these shares are increased to one-half of the estate. The remaining portion is known as the dead's part (*q.v.*). The widow is also entitled to *terce*, i.e. a life rent in one third of her husband's heritable property. A surviving husband and children have comparable rights in the wife's estate. The dead's part is the only portion of which the testator can freely dispose. A pupil cannot make a valid will. A minor may dispose of moveables without the consent of any other person, but, unless he is a member of the forces, he cannot dispose of heritage. A W. must be in writing (except that a person may leave a legacy verbally if the amount does not exceed £8 6s. 8d. sterling.) A W. may be either *holograph*, in which case no witnesses are necessary (see *HOLOGRAPH*); or *tested*, i.e. signed in the presence of two witnesses. It is not necessary that these witnesses should sign in the presence of one another or even that they should see the testator signing, so long as the latter acknowledges his signature to the witnesses. It is better that the will be not witnessed by a beneficiary but if it is, that fact will not invalidate the attestation or the gift. A Scottish will is not revoked by the subsequent marriage of the testator. The subsequent birth of a child, for whom no testamentary provision has been made, may revoke a will in whole or in part. A will is revoked by a later will either expressly or by implication, but in so far as the deeds can be read together, both will have effect. 'Confirmation,' the Scottish equivalent of probate, is obtained in the Sheriff Court of the county in which the testator was domiciled at the time of his death or, where he had no fixed domicile, in the commissariat of Edinburgh. The Wills Act, 1837, does not apply to Scotland. By the Common Law of Scotland, a Scottish soldier, sailor, or airman, like any other domiciled Scot, can make a valid will without having it witnessed, provided that it is written, or that the essential parts of it are written, in his own hand. Under the Confirmation of Executors (War Service) Scotland Act, 1940, a Scottish soldier who is under 21 can make a valid will disposing of moveable property or real

or heritable property only if he is in actual military service.

In the U.S.A. the general age of testamentary capacity is eighteen. By the constitutions of many states laws giving effect to informal or invalid wills are forbidden. In some states children cannot be disinherited without good cause. Holograph wills are in use. Two witnesses are necessary and, as in England, wills of members of the armed forces are privileged.

See *CODICIL*; *HOLOGRAPH*; see also *EXECUTOR*; *PROBATE*. See F. V. Hawkins, *Concise Treatise on Construction of Wills* (3rd. ed. by C. P. Sanger, 1925); T. Jarnan, *Wills* (7th ed., by C. P. Sanger and I. C. Willis, 3 vols., 1930); and H. S. Theobald, *Laws of Wills* (10th ed., by J. H. C. Morris, 1947).

**Will's Coffee House**, see under *COFFEE HOUSES*.

**'Willy-willy,'** see *TORNADO*.

**Willsneck**, see under *QUANFORD HILLS*.

**Wilmington**, vil. of Sussex, England, 6 m. from Eastbourne. Near it is the Long Man of Wilmington (see *WHITE HORSES AND HILL FIGURES*). There are also the ruins of a Benedictine priory.

**Wilmslow**, urb. dist. of Cheshire, England, 6 m. S.E. of Stockport and 177 m. from London. It is a residential dist. Pop. 17,700.

**Wilno**, see *VILNA*.

**Wilson, Charles Thomson Rees** (b. 1869), Brit. physicist, b. at Gloucester, Middlesbrough, and educated at Owens College, Manchester, and Sidney Sussex College, Cambridge, of which he was Fellow. He has worked on research on condensation nuclei, ions, and atmospheric electricity (see *WILSON CLOUD CHAMBER*). He won the Nobel Physics Prize in 1927.

**Wilson Cloud Chamber**. When fast-moving charged particles, such as  $\alpha$ -particles, pass through a gas, they tear off electrons from the atoms that they encounter. The result is a large number of ionised atoms which, however, unite very soon with the torn-off electrons and return to normal conditions. If some means could be devised to make the electrons visible, or alternatively, to make visible some condensation on these loose electrons, the tracks, of the  $\alpha$ -particle would be obvious. While it is impossible to see the electrons themselves it is possible to see a condensation on them by means of the W. C. C., the principle of which is as follows. It is well-known that water vapour condenses on small nuclei, such as fine dust or soot in the atmosphere, and ions can play the same part as these particles. If there is a fall in the barometer and a lowering of the temp. in the atmosphere, condensation takes place more easily, and an artificial method for producing favourable conditions for the precipitation of water vapour on ions is accomplished by the C. C. In its simplest form it consists of a metallic cylinder with a glass cover, the latter containing a piston which can be moved up and down to lower the pressure. Mixed with the gas or air between the glass cover and the piston is a large amount of water vapour,

and as soon as the  $\alpha$ -particles, or other missiles used for the bombardment, have entered the chamber a movement of the piston causes a sudden expansion, which is rapid enough to be adiabatic and cools the gas. Precipitation in the form of very fine bands of fog takes place on the electrons, and as these bands are illuminated by a strong light through a side window, they can be observed and photographed. This simple piece of apparatus has provided most valuable information on the results of nuclear bombardment. See NUCLEUS; RADIUM; WILSON, C. T. R.

**Wilson, John** (1783-1854), Scottish author, wrote under the pseudonym of 'Christopher North.' He was b. at Paisley and studied at Glasgow Univ. and Magdalen College, Oxford. When *Blackwood's Magazine* was estab. in 1817 W. came into prominence. He was one of the original staff and a regular contributor. It is as the chief author of the *Noctes Ambrosianæ* that he is best remembered, and in those papers he displayed to the full his admirable literary gifts. See lives by M. Gordon, 1862, and E. Swann, 1934.

**Wilson, Richard** (1714-82), Brit. painter, b. at Penegoes, Montgomeryshire. He studied art in London and afterwards in Italy. His pictures were little in demand during his lifetime, and it was not till many years after his death that he became recognised as the first great Eng. master of landscape painting. When he went to Italy (1750), W.'s intention was to develop his portrait paintings, but on the advice of Claude Vernet (q.v.) he decided to abandon it for landscape. The prin. sources of his inspiration during his five years' stay in Italy were the seventeenth century Fr. masters Claude Lorraine and Gaspard Poussin. He returned to England in 1757 and for the rest of his life continued to paint many lt. subjects. He found inspiration in the Welsh mts and his 'Cader Idris' is one of his best works. He also painted a number of views of country mansions, in which predominance was given to the picturesque setting rather than to architectural considerations. Among the best are 'Croome Court, Worcestershire' and 'Burly House, Cheshire.' See A. Bury *Richard Wilson, R.A., The Grand Classic*, 1948.

**Wilson, (Thomas) Woodrow** (1856-1924), twenty-eighth President of the U.S.A., b. at Staunton, Virginia, of Scots-Irish descent. W. spent the early and formative years of his life in Georgia and S. Carolina and so saw something of reconstruction in the S. after the Civil war. He graduated from Princeton, and then graduated in law from the Univ. of Virginia, practised for a short time at Atlanta, and then went to Johns Hopkins Univ., where he obtained his Ph.D. in 1886. From 1886 to 1888 he was associate prof. of hist. and political economy at Bryn Mawr College, and from 1888 to 1890 held the same post at Wesleyan Univ. In 1890 he returned to Princeton Univ. as prof. of jurisprudence and political economy and in 1902 became President of Princeton. In 1910 W. was elected

Democratic governor of New Jersey and succeeded in effecting many reforms. Those made him a prominent public figure, and in 1912, after a sharp contest, W. was nominated Democratic candidate for the Presidency. The Republican vote was split, and resulted in W. being overwhelmingly elected. The Democrats had also the control of both Houses of Congress. In his inaugural address the new President outlined a vigorous policy of reform. The prin. Acts of his administration were the Underwood Tariff Bill, the Federal Reserve Act, the Clayton Anti-Trust Act, which gave organised labour its charter of freedom, and the repeal of the Panama Canal Tolls Act. Few administrations in Amer. hist. could point to finer domestic accomplishments. But W. was less fortunate in his foreign policies, and for a time war with factions in Mexico seemed imminent. But greater events turned the country's attention elsewhere, and when the First World War broke out, it was the fixed policy of the country to remain free from entangling alliances and European wars. All that W. was called upon to do was to issue the neutrality proclamation usual in such crises. W. pursued this policy with determination, hoping that, after a time, the U.S.A. might act as mediator to end the conflict. (See further under WORLD WAR, FIRST).

At the election of 1916 W. was re-elected. His 'peace without victory' address on Jan. 22, 1917, was his last effort to bring the War to an end by peaceful methods. On April 2, 1917, W. asked Congress to declare war on Germany and her allies. For details of the U.S.A.'s actions during the war see WORLD WAR, FIRST, U.S.A. (HISTORY). When the war was ended and the peace conference was to meet at Versailles, W. announced that he would himself lead the Amer. delegation. With Lord Robert Cecil and others he drew up the Covenant of the League of Nations. He returned to America early in 1919 with the draft of the Covenant. He found a hostile and factious Senate controlled by the Republicans. In July 1919 he at once declared that the text of the peace-treaty and the Covenant of the League of Nations were inter-dependent and that one could not be adopted without the other. W. prepared to appeal to the people over the heads of the Senate, and undertook a national speech-making tour. He had a mainly cool reception, and in Sept. he had a serious breakdown at Wichita, Kansas. Unable to fight, W. nevertheless intimated that he would accept a mild reservation to Article Ten of the Covenant. But as reported and voted on in March 1920, it contained stronger reservations than he had been willing to accept. As the controversy went on, the bulk of the people veered into opposition, because of traditional feeling that the U.S.A. should in no way be entangled in foreign alliances or undertakings. The election of 1920 resulted in an overwhelming victory for Harding, the Republican, against Cox, the Democratic candidate. Some con-



solation came to W. when in Dec. 1920 he was awarded the Nobel peace prize.

W.'s place in hist. is secure, though his actions and beliefs are still the subject of controversy. He never achieved the kind of popularity his great opponent, Theodore Roosevelt, enjoyed; he had none of Roosevelt's expansiveness and robust vitality, and struck many as cold and aloof. But he was keenly aware of the suffering and fears of ordinary people. He saw beyond the boundaries of his own country and gave inspiration to the ideal of international gov. He failed because he was not enough of a politician to appreciate in his enthusiasm that his own country and most others were not ready to acknowledge his solution. *See* lives by R. S. Baker, 1923-36; W. A. White, 1926; W. E. Dodd, 1932; W. S. Myers, 1947. *See also* T. A. Bailey, *Woodrow Wilson and the Great Betrayal*, 1946; E. M. Hughes Jones, *Woodrow Wilson and American Liberalism*, 1947; A. S. Link, *Wilson, The Road to the White House*, 1947.

**Wilton**, mkt. tn. and mun. bor. of Wiltshire, England, celebrated for its carpets since the time of Elizabeth. It was the seat of a bishopric until 1075, and was the cap. of Wessex. Wilton House is the seat of the earls of Pembroke. W. gave its name to the co. Pop. (estimated) 2700.

**Wiltshire**, S.W. co. of England, bounded N. by Gloucestershire, S. by Dorsetshire and Hampshire, E. by Hampshire and Berkshire, and W. by Gloucestershire and Somersetshire. The surface is for the most part hilly, and includes Salisbury Plain (20 m. by 16 m.) in the S., some 4000 ft. above sea-level, with the North Downs forming its N. border, and to the N.E. the Marlborough Downs and Saverlake Forest. The prin. rvs. are the Kennet, the Lower or Bristol Avon, the Salisbury Avon, and the Nadder. There are also the Thames and Severn Canal, the Wilts and Berks canal, and the Kennet and Avon canal. Oats is the main crop; large numbers of sheep are reared, and a considerable area is under permanent pasture. Dairy-farming flourishes, and there are condensed-milk manufs. Cheese and bacon are also made. At Swindon there are railway locomotive works; at Devizes large engineering works; cloth and carpets are also manufactured at Trowbridge, Wilton, etc. There are iron mines near Westbury and Bath, and Portland stone is quarried. Other tns. are Calne, Chippenham, Warminster, and Malmesbury. Salisbury (*q.v.*) is the co. tn. The co. (including Swindon) returns five members to Parliament. W. is famous for its prehistoric monuments, of which Stonehenge and Avebury are the best known. Some two hundred and fifty monuments are scheduled for protection. There are numerous eccles. ruins of later periods, including the abbeys of Malmesbury, Lacock, and Edington. The Saxon church of St. Lawrence at Bradford-on-Avon is also notable. Salisbury Cathedral is a fine example of the Early Eng., and the par. churches are, many of them, of great interest. There are castle ruins at

Old Sarum, Marlborough, and Devizes, and Wardour Castle, dating from the eighteenth century, has a fine collection of curios, including the famous 'Glastonbury Cup.' The area is 860,829 ac. Pop. 346,000. *See* Sir R. Colt Hoare, *History of Ancient Wiltshire*, 1811-12; *History of Modern Wiltshire*, 1822; A. G. Bradley, *Round about Wiltshire*, 1907; E. Hutton, *Highways and Byways in Wiltshire*, 1917; H. W. Timperley, *Ridge Way County*, 1935; A. Mee, *Wiltshire: Cradle of our Civilisation*, 1939; R. Dutton, *Wessex* 1950; and the books on W. by R. L. P. Jowitt (Batsford's Little Guides), 1949, and R. Whitlock, 1949.

**Wiltshire Regiment** (Duke of Edinburgh's), Eng. regiment, formerly the 62nd and 99th regiments. The 62nd was formed in 1756 as the 2nd Battalion to the 4th Foot (now King's Own Royal Regiment (Lancaster)), but was made a separate corps in 1758. The regiment took part in the defence of Canada and in the Amer. War, 1776-77, fought in the Peninsula under Wellington, then went to the W. Indies and later to India, where it took part in the First Sikh war. It was also in the Crimea. The 99th was raised in 1824 and served in Mauritius, Australia, and later in the New Zealand campaign of 1846-47. It took part in the China war, 1860, and then went to S. Africa. The regiments were linked in 1881 and served in the S. African war, 1899-1902. During the First World War they raised 12 battalions and served in France, Flanders, Macedonia, Gallipoli, Palestine, and Mesopotamia. In the Second World War the regiment fought on the W. front, in the It. campaigns, and in Burma. They took part in the operations of the Second Army in Europe, notably in the heavy fighting of the Rhine operations of March 1945.

**Wimbledon**, parl. and mun. bor. of Surrey, England. The ann. meetings of the National Rifle Association were formerly held on Wimbledon Common (1860-89). W. is the headquarters of the All-England Lawn Tennis Club, where international championships for amateurs are held annually. It has interesting remains of an early Brit. earthwork. W. sends one member to Parliament. Pop. 57,900.

**Winborne Minster**, mkt. tn. of Dorsetshire, England, 6 m. N. of Poole; it is an agric. centre. The collegiate church or minster, dating from the Conquest, contains the tomb of Ethelred I. and has a fourteenth-century clock. Near W. is Canford School, a public school for boys, founded in 1923. Pop. (estimated) 4200.

**Winchurst Machine**, an electrical apparatus producing static charges by induction. It was invented by James Winchurst (1832-1903).

**Winant, John Gilbert** (1889-1947), Amer. diplomat and State Governor, b. in New York and educated at St. Paul's school, Concord, and at Princeton Univ. He was elected in 1917 to the legislature of New Hampshire as a Republican, and joined the Amer. expeditionary force in the First World War, commanding one of the first Amer. air squadrons. Later

he made a fortune in the discovery and exploitation of oil-fields in Texas. In 1921 he became a senator of New Hampshire, and in 1935 was elected Governor of the State, being twice re-elected. In 1935 he was appointed assistant director of the International Labour Organisation, becoming its director in 1938. Early in 1941 Roosevelt appointed him ambas. to Great Britain. In 1943 he attended the Casablanca and Teheran conferences and was named U.S. representative on the European Advisory Commission (see *EUROPE (History)*), and at the first General Assembly of the United Nations in London (1946) he was chief Amer. representative on the Economic and Social Council, a post which he resigned about a year before his death. W. received an honorary O.M. in 1946. His memoirs, *A Letter from Grosvenor Square*, were pub. in 1947.

**Winchcombe** (anct. *Winclecombe*), mkt. tn. of Gloucestershire, England, in a valley of the Cotswolds, 6 m. N.E. of Cheltenham. W. has a fine church, and Sudeley Castle (fifteenth century) and Hailes Abbey are nearby. There are flour and paper mills. Pop. (estimated) 3000. See C. T. Haigh, *The History of Winchcombe Abbey*, 1948.

**Winchelsea**, par. and former Cinque Port of Sussex, England. New W.'s harbour became choked in the sixteenth century. There is a fourteenth-century par. church. Pop. 150.

**Winchester**, cathedral city, co. tn., and mun. and parl. bor. of Hampshire, England, on the Itchen, 12 m. N.E. of Southampton and 66 m. by rail from London. W. was the *Caer Gwent* (White City) of the Britons and an important Roman centre. It was a tn. of strategic importance in early times on account of its central situation on the Roman military roads of S. Britain. Its present name comes from a Saxon corruption, 'Wintanceaster' (*J.-S. Chron.*). The Saxon kings of Wessex, who made W. cap. of England, are said to have been crowned in the old cathedral, of which no traces remain. During this period the W. illuminators became famous. The most notable work they produced was Æthelwold's Book of Hours (975-80). The delicacy of the 'Winchester style' shows Carolingian influence. The present cathedral was begun by Bishop Walkelin in the eleventh century. Additions were made by Wm. of Wykeham and others, so that the styles of architecture vary from Norman and Early Eng. to Perpendicular. An outstanding feature is the Early Eng. Lady Chapel, and there are some particularly fine chantry chapels. It is the longest cathedral (556 ft.) in Eng., with a nave of 351 ft. The Great Screen in the Choir was erected during the fifteenth century and is of exquisite workmanship. The cathedral contains the tombs of Wm. Rufus, Cardinal Beaufort, Izaak Walton, and Jane Austen, and the chantry of Wm. of Wykeham. Among kings of England crowned or re-crowned in the cathedral were Wm. the Conqueror, and Richard I., after his return from

captivity. Here also Queen Mary was married to Philip of Spain. Not far from the cathedral lie the ruins of Wolvesey Castle, and to the N. those of Hyde Abbey, in which King Alfred was buried. The remaining wing of Wren's palace on the site of the old castle is the official residence of the Bishop of W. W. Castle, also known as the King's Castle, had a hist. dating back to the Conquest. The West gate is one of the two remaining gates of the city, the other being the Kings gate. Originally used as a prison, it has now been turned into a museum. St. Cross Hospital was founded in 1136 by Bishop Blois. Cardinal Beaufort endowed it in 1446 for the Brethren of Noble Poverty. To-day, there are twenty-seven pensioners on the two foundations living there, besides many out-pensioners. The church of the Hospital is a fine example of transitional Norman work. Winchester College (*q.v.*), was founded by Wm. of Wykeham in 1382. St. Swithin's, a small medieval church over the King's Gate is the most remarkable of W.'s churches. The old city mill, which for hundreds of years has spanned the Itchen above Eastgate Bridge, has been preserved by the National Trust.

During the Second World War, W. was an evacuation centre. A few bombs were dropped in the city, but no building of historic interest was damaged. W. is a military centre, and a mkt. for agric. produce from the surrounding dist. Pop. 21,000. See G. K. Kitchin, *Winchester* (Historic Town Series), 1901; W. Woodland, *Winchester* (Medieval Town Series), 1932; and A. F. Leach, *Winchester, its History, Buildings and People* (3rd ed.), 1933.

**Winchester College**, Eng. public school founded by William of Wykeham in 1382; on it the Eng. public school system has been largely modelled. The full title of the school is 'The College of St. Mary at Winchester.' The pupils are divided into seventy scholars and about four hundred commoners, the former boarding in the college, the latter in ten nearby houses. The chapel, quadrangle, cloisters, and other old buildings are still used, though there have been some additions. There is an impressive memorial to Wykehamists killed in the First World War, designed by Sir Herbert Baker. The governing body consists of a warden and fellows. The school has a close connection with New College, Oxford, where scholarships are reserved for its pupils. There are entrance scholarships and s.c.v. leaving scholarships and exhibitions. A few vacancies are now offered to selected boys from schools under Local Authorities.

**Winckelman**, Johann Joachim (1717-68). Ger. archaeologist and art critic, b. at Stendal, Brandenburg, the son of a shoemaker. He first studied theology at Halle, but preferred ant. art and literature, especially that of the classic Gks. In 1755 he was offered a scholarship in Italy by the gov. of Saxony. W. was converted to Rom. Catholicism and became librarian to the cardinal-secretary of state in Rome, and in 1763 president

of the Collection of Antiquities in the Vatican and Vatican Librarian. He was able to acquire a vast knowledge of anc. arts and became the leading authority of his time. The galleries of Rome and Florence are indebted to him, and his advice was of immense value in the excavation of Pompeii and Heroulaneum. His main work was a fundamental and comprehensive study of anc. art in two parts. The first part was *Gedanken Über die Nachahmung der griechischen Werke* (1755). The second part, *Geschichte der Kunst des Altertums* (1764: new ed., 1934), became world-famous. See K. Krauss, *Winckelmann und Homer*, 1935; L. Curtius, *Winckelmann und seine Nachfolge*, 1941; and lives by C. Justi, 1866-72, 1923, and B. Vallengin, 1931.

**Wind**, horizontal movement of the air. The W. is not always horizontal, particularly at high levels; near the surface it must, for reasons of continuity, follow the slope of the surface, and it is the horizontal motion that is most easily noticed and which moves a W. vane. The W. is never steady: the eddies varying from sec. to sec. in gusts, which are frequently as much as 20% in direction and 20 per cent in velocity different from the mean W.

may be neglected, the W. speed is measured at a height of 10 metres (33 ft.) and it is usual to call this the surface velocity even though it is usually much more than the wind at ordinary eye level. Above this level (1000 ft. to 3000 ft.) according to rate of change of temp.), the wind approximates to that given by a comparatively simple hydro-dynamic law which blows along the isobars with high pressure on the right (in the N. hemisphere) with a speed inversely proportional to the distance between them.

**Wind measurement.**—Direction is easily measured by a W. vane or, in very light winds, by smoke drift. A change in the W. direction is called veering if it changes clockwise and backing if anticlockwise. W. strength or velocity is much more difficult to measure: the first, severely practical, method was that devised by Adm. Beaufort in 1805, based on the usefulness and effect of the W. for sea-faring purposes. The following table gives a specification of each of these Beaufort forces, which are still in use. Equivalent W. velocities as measured by anemometers (q.v.) at 33 ft. above a level surface are given in the last column.

Beaufort number	Beaufort's description	Land effect as devised by Sir George Simpson in 1905	Velocity (at 33 ft.)
0	Calm	Smoke rises vertically	m.p.h. 0-1
1	Light air	Direction shown by smoke but not by vane	1-3
2	Light breeze	Wind felt on face; leaves rustle; ordinary vane moved	4-7
3	Gentle breeze	Leaves and small twigs in constant motion; extends a light flag	8-12
4	Moderate breeze	Raises dust and loose paper; small branches moved	13-18
5	Fresh breeze	Small trees in leaf begin to sway; crested wavelets form on inland waters	19-24
6	Strong breeze	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty	25-31
7	Moderate gale	Whole trees in motion; inconvenience felt when walking against wind	32-38
8	Fresh gale	Breaks twigs off trees; generally impedes progress	39-46
9	Strong gale	Slight structural damage occurs (chimney pots and slates removed)	47-54
10	Whole gale	Seldom experienced inland; trees uprooted; considerable structural damage	55-63
11	Storm	Very rarely experienced inland; accompanied by widespread damage	64-75
12	Hurricane	.. .. .	Above 75

This table has recently been extended to Beaufort numbers 13-17 with respective velocities 83-92, 93-103, 104-114, 115-125, 126-136 m.p.h.

This gustiness obviously depends on the nature of the underlying surface but also much experiment has shown that with loss of temp. with height, gustiness is much greater than with gain of temp. with height. Ignoring surface irregularities such as buildings, hedgcs, trees, etc., gustiness decreases upwards but at the same time the velocity increases until the surface effect is negligible. So that differences in the nature of ground

W. above surface level can be measured by watching the clouds (or a shell burst), by tracing the ascent of a hydrogen-filled balloon, or, for extremely high levels, by calculations from the audibility and timing of distant explosions such as gunfire. The clouds are usually watched in a mirror or by means of a specially constructed instrument—the nephoscope. The simplest version of this is a number of sharp-pointed vertical spikes mounted in

a straight line which can rotate about a vertical axis until it lies parallel with the direction of movement of the cloud. The hydrogen-filled balloon or *Pilot Balloon* is allowed to rise freely; it drifts with the W. so that if, by theodolite, its position can be observed and calculated the W. velocity can be measured at all heights to which the balloon can be seen. The height can be estimated by assuming a constant rate of rise of the balloon or even measured by using two or more theodolites. A new method, which allows the balloon to be followed through cloud and to greater distances, is to attach a small radar target to the balloon and follow the balloon by radar (*q.v.*). Upper winds have thus been directly measured up to heights of 100,000 ft.

**Windbelts.**—Semi-permanent anticyclones develop over subtropical oceans and consequently the Ws. blow more or less steadily round them. These form the trade Ws. (*q.v.*) on the equatorward sides and the prevailing westerlies on the polar sides. In the centres of the anticyclones are regions of calms—the Horse Latitudes—whilst between the anticyclones in the N. hemisphere and the corresponding ones in the S. hemisphere is a belt of light winds or calms known as the Doldrums. These regions all move with the sun during the year but with little more than 20° total movement compared with the sun's 47°. The westerlies on the poleward sides of the anticyclones enter into the region of depressions and frontal surfaces (*see* METEOROLOGY) so that they are more variable and stronger. In the S. hemisphere (in the 'Roaring Forties' after their latitude), they are known as the Brave West Ws. In polar regions, which are very disturbed, the Ws. are very variable.

The earth's surface consists of land and water distributed irregularly; since the temp. rises and falls more rapidly over land than over the sea, high pressure develops over the land masses in winter and low pressure in summer and there is therefore a large seasonal change of wind, blowing in summer, outblowing in winter. They are known as monsoons (*q.v.*), and are well marked in many parts of the world chiefly in S. and E. Asia. A similar effect can be observed daily on quiet sunny days when the sea-breeze sets in.

The physical features of the land also have a marked effect on the W. for it will tend to flow along valleys and round mt. ranges rather than across them. Long ravines may even develop strong Ws. if a pressure difference is maintained between ends of the ravine, for it generates a stronger and stronger W. as it continues along the ravine. During a clear night the ground cools and the air in contact cools with it. On a slope the air in contact is therefore cooler than the air away from it but at the same level; and, being heavier, it then flows downhill like water. This is called katabatic W., the similar W. in the reverse direction on warm sunny days being an anabatic W. The katabatic naturally drains into the valleys and may eventually augment any ravine W. This

does occur in the *mistral* of the Rhône valley which reaches Marseilles as an icy blast, often at gale strength. When a W. is forced to rise over high land it deposits some of its moisture, and consequently when it descends again it appears phenomenally warm and dry. Such Ws. coming from the Alps in Austria are known as Föhn Ws., and coming from the Rockies are known as the Chinook. *See* C. E. P. Brooks, C. S. Durst, N. Carruthers, D. Dewar, and J. S. Sawyer, *Upper Winds over the World, Geophysical Memoirs* (vol. 10, No. 85), 1950; also bibliography to METEOROLOGY.

**Winckler, Hugo** (1863-1913), Ger. oriental scholar, b. at Gräfenhammchen. He studied at Berlin Univ., and was prof. of hist. and oriental languages there from 1904. In 1903-04 he made excavations on the site of anct. Sidon, and from 1906 until 1912 at Boghaz Keui in Cappadocia. Here he discovered valuable remains of a Hittite civilisation, including a version in cuneiform of the Hittites-Hittite treaty.

**Windermere**: 1. largest lake in England (11 m. by  $\frac{1}{2}$  to 14 m. broad), on the boundary of Westmorland and Lancashire. Its shores are much indented and wooded, growing steeper towards the N. It drains into Morecambe Bay through the Leven. *See also* LAKE DISTRICT. 2. Urb. dist. in Westmorland, England. 4 m. S.E. of Ambleside. It was formerly called Bithwaite. Pop. 6000.

**Windflower**, *see* ANEMONE.

**Windhoek**, settlement, cap. of S.W. Africa. It has hot thermal springs, and is connected by railway with Swakopmund, on the coast, and with Keetmanshoop (a distance of 380 m.). There are mineral deposits in the dist. W. was entered by Brit. forces in May 1915 when the colony of S.W. Africa was captured from the Gers. Pop.: European (Afrikaner, Ger., and Eng.), 5000; coloured, 1800.

**Wind Instruments** are of three classes.

(1) keyboard, *e.g.* organ, concertina, etc., played by bellows; (2) wood-wind, *e.g.* clarinet, flute, oboe, bassoon, and other reed instruments, played by mouthpiece, and (3) brass, *e.g.* horn, trumpet, trombone, and other instruments with cup-shaped mouthpieces.

**Windmill Hill**, hill 1½ m. N.W. of Avebury, Wilts., England, is the site of an earthwork camp with interrupted ditches which has given its name to the earliest culture of the English Neolithic. These farmers bred cattle, cultivated wheat in small plots, specialised in the mining of flint for tools and weapons, and traded in these products and they introduced, particularly from Switzerland and France, a distinctive type of pottery which in the first instance was derived from leather prototypes. A detailed study of this pottery has suggested three distinct migrations in the make-up of W. H. culture. Some of the W. H. area is preserved by the National Trust.

**Windmills.** The earliest references to W. in England appeared late in the twelfth century, when a mill could be built only for the lord of the manor. From then until

the fourteenth century, W. were of the type known now as post mills. The principle of such a mill is generally as follows: the body is supported on a massive wooden post, upon which it may be rotated to face the wind; and the post rests upon two wooden cross-trees with four supporting struts or quarter bars. The cross-trees usually stand on four brick or stone piers, which are often enclosed in a round-house, which is used for storage. The mill sails are attached to a wooden or cast iron windshaft, which is usually inclined to the horizontal at an angle of  $10^{\circ}$  to  $15^{\circ}$ , and which carries a large wood-toothed gear



*Photograph by D. W. Muggeridge: Society for the Protection of Ancient Buildings*

#### OUTWOOD MILL, SURREY

wheel. This gear wheel, called the brake-wheel because it has about it a wooden or iron brake band, drives the horizontal millstones through a small pinion or nut. There is sometimes a second large gear wheel on the windshaft known as the tail wheel, which drives a second pair of millstones nearer the tail of the mill. Access to the mill body is by a ladder, through which protrudes a long tail pole used for facing the mill to the wind. Sacks of grain are lifted up inside the mill by a hoist driven from the windshaft, and tipped into hoppers which feed the stones. The meal runs from the stones into bins or sacks, or perhaps into a dresser which makes flour by separating the bran from the meal. One of the earliest mills remaining in England is the post mill at Bourn, Cambridgeshire, research having estab. that it was there in 1636; the earliest still at work is that at Outwood, Surrey, built in 1665.

About the middle of the fourteenth century the tower mill was invented.

In such a mill, the machinery is contained in a round or octagonal body, and the cap at the top carries the sails and is turned to face the wind. The internal economy of the tower mill is similar to the post mill, except that the brake wheel drives an intermediate gear or wallower at the top of a vertical shaft, which conveys the power to the millstones on the first floor of the mill. The second floor carries the hoppers which feed the stones, and the floors above are used for storage. The body of a tower mill proper is built of stone or brick, but frequently wooden studwork and weatherboarding is used from the first floor, or stone floor, upwards. In this case the mill is known as a smock mill. The cap is made of wood, sometimes protected with canvas, and the shape of the cap is identifiable with the dist. in which the mill is built. A cap shaped like an inverted boat is common in Norfolk, whilst in Lincolnshire, where the tower mill is most highly developed, the graceful ogee-shaped cap is typical. The problem of turning a rotating cap on top of a tall tower was not conveniently met by the use of a tail pole, as in post mill practice. Accordingly, other methods were invented. The top of the tower, on which the cap rests and is rotated, is called the curb. A rack was fixed round the curb, and a gear attached to the cap and meshing with the rack was turned by a chain wheel, and a chain hanging down to the ground. This system simplified the operation, and examples remain to-day. In 1745, however, a method of facing the sails to the wind automatically was patented by Edmund Lee. A fan was placed behind the cap at right angles to the sails. When the sails are facing the wind the fan is stationary, but when the wind changes its direction the fan is turned. The fan is geared to the rack round the curb, and therefore turns the cap until the sails again face the wind. This system has since been applied also to post mills.

The oldest windmill sails consisted of a wooden framework covered with canvas. The canvas hung on rings like curtain rings and was drawn across the sail, like a curtain, to cover the framework partially or completely as required, and tied in place. To carry this out the miller had to climb the sails, which was often hazardous. In 1772 Andrew Meikle invented the spring sail. This had, instead of canvases, a number of shutters similar to a Venetian blind, held shut by springs, the tension of which was adjustable. A further improvement was the 'Patent' sail, invented in 1807 by Sir Wm. Cubitt. This is the sail now most commonly seen, and consists of a number of shutters held closed by a weight, which, working through a system of levers and links, hangs on a chain close to the ground at the tail of the mill.

At one time there may have been as many as ten thousand W. working in England. At the present time (1950), there are less than fifty, and the number is decreasing steadily. Apart from mills used for grinding corn, some two thousand

marsh mills once pumped water off the fenland. Now none of these is left at work. Considerable improvements in windmill efficiency have been made by Dekker, in Holland, using roller bearings and sails of aerofoil section, but the W. used in contemporary experiments in generating electricity by wind-power bear no resemblance to the traditional corn mill. An important experiment of this kind was carried out with a 1500 kilowatt generator driven by a 200 ft. wind turbine having two blades of adjustable pitch. This set was built at Grandpa's Knob, near Rutland, Vermont, U.S.A., in 1940-41, and valuable data were obtained. See P. C. Putnam, *Power from the Wind*, 1948, and R. Wallis, *Windmills in England*, 1948.

**Windmill Theatre**, London theatre, seating 320, situated in Great Windmill Street, W.1. At first a straight playhouse, and then a cinema, it was opened in 1932 by Mrs. Laura Henderson and Vivian Van Damme for the presentation of non-stop variety. In 1936 Van Damme took over production. During the Second World War the W. took as its motto 'We Never Closed,' and became famous as the only theatre to remain open during the whole of the London blitz. When she died in 1944, Mrs. Henderson left the W. to Van Damme who now became owner-manager-producer. The *Revuede-ville* production which plays six performances a day has a change of programme every six weeks, two troupes of girls working alternate days.

**Window Gardening**. This term is applied to the growing of plants and flowers in pots, bowls, and boxes placed upon the outside window-sills of houses or flats and is practised in this, where space for gardens is non-existent. With careful planning a fine display of colourful flowers may be had for a greater part of the year. Success depends upon the careful planning of a succession of suitable plants; bulbs in spring, daffodils, narcissi, hyacinths; later freesias, nasturtiums, petunias, lobelias, and geraniums, all provide colourful displays.

**Windpipe**, see *TRACHEA*.

**Windsor**: 1. Mun. bor., in full the Royal Bor. of New Windsor, in Berkshire, England, on the Thames, and 22 m. from London. W. adjoins the vil. of Old Windsor, 2 m. to the S.E. It contains a town hall built under the supervision of Sir Christopher Wren in 1686, the church of St. John the Baptist (rebuilt 1822), with fine examples of Grinling Gibbons's wood-carving, and a fine Jubilee statue of Queen Victoria; but it owes its importance to the castle, which is one of the prin. royal residences and the Great Park. Eton College (q.v.) is outside W. The tn was formerly famous for its mns, one of which, the Garter (demolished c. 1680), is frequently mentioned by Shakespeare. The par. church of Clewer St. Andrew is a fine example of Norman architecture. W. is a co. constituency. Pop. 23,300. 2. City, co. tn. of Essex, and lake port of Ontario, Canada,  $\frac{1}{2}$  m. S. of Detroit, with which it is connected by the Am-

bassador Bridge and Detroit-Canada Tunnel, across the Detroit riv., 240 m. W. of Toronto. It is a port for all Canadian steamers on the Great Lakes and is on the Canadian National and Canadian Pacific Railways, and on three U.S. railway lines. It has a modern airport. It is the centre of Canada's motor-car industry, and also produces some two-thirds of the dominion's pharmaceutical output. It has over 350 factories. Its other industries include tools, adding machines, clothing, paint, forgings, and stampings, etc. W. has numerous public, primary, and secondary schools, and several public libraries. There are three hospitals and a great many parks. The city is in the midst of a good mixed farming dist., and there are salt mines in the vicinity. Electric power is obtained from the Niagara Falls. Pop. 121,000.

**Windsor Castle**, Eng. royal palace. It is one of the best-known among the royal edifices of Europe. The first structure on the site was that of the Conqueror, but the plan did not begin to assume its present state and arrangement until the fourteenth century, when extensive building operations were carried on under the surveyance of Wm. of Wykeham. One of the most impressive features of W. Castle is St. George's Chapel, a fine example, though much restored, of Perpendicular architecture, in which many Eng. sovereigns are buried. Under Elizabeth the terraces were formed and the castle was thus given one of its most striking and attractive characteristics. George III., among other alterations, renovated the interior of St. George's Chapel, but the main work of improvement was left to his successor, under whom extensive alterations were carried out under Wyatt. To the S. of the castle is Windsor Great Park, comprising 1800 ac.; it is stocked with fallow deer. See H. Bolitho, *Romance of Windsor Castle*, 1947.

**Windsor, Duke of**, see EDWARD VIII.

**Windsor, House of**. Family name of the royal house of Great Britain, King George V. being regarded as the founder, having, in 1917 given up for himself and his family all Ger. titles, together with the dynastic names of Saxe-Coburg-Gotha acquired through the marriage of Queen Victoria with Prince Albert. On July 17, 1917, King George V. declared by proclamation that thenceforth his family should be known as 'The House and Family of Windsor.'

**Wind Sucking**, see *under* HORSE (DISEASES).

**Windt, Harry de**, see DE WINT, HARRY.

**Wind Tunnel**, tubular structure in which models are subjected to artificial winds in order to test their aerodynamic properties and their resistance to wind pressure. W. Ts. are used in aeroplane and bridge building.

**Windward Islands**, group of the Brit. W. Indian Is., comprising the colonies of Grenada (the seat of the gov.), Dominica, St. Vincent, and St. Lucia, with their dependencies, the Grenadines, being divided between Grenada and St. Vincent.

Universal adult suffrage was among the modifications of the constitutions approved in 1950. Cocoa, rum, sugar, arrowroot, and spices are produced. Area approximately 800 sq. m. Pop. 175,000. See also WEST INDIES.

**Wine**, name given to the fermented juice of the grape. The term is also employed to designate alcoholic beverages obtained from the fermentation of the juice expressed from apples, elderberries, rhubarb, etc., but always with the name of the fruit or vegetable as the adjective (see WINES, HOME-MADE). The making of W. was well known to the ancients, especially to the Romans. The juice, or 'must,' as it is called, expressed from the grape, is a viscous liquid consisting of water-holding sugars and various organic and inorganic acids and salts in solution. On exposure to the heat of the sun the 'must' spontaneously ferments. In a few days the fermentation reaches a maximum and the liquid is well stirred and then allowed to stand for about a month. It is then clear and a precipitate has formed at the bottom of the vats. The W. is removed to other vessels and left for a period of sev. months to complete the after-fermentation. At the end of this time all the sugars in the juice have been converted into alcohol and carbon dioxide. The precipitate from the W. is called argol, and consists chiefly of potassium hydrogen tartrate, containing impurities such as calcium and magnesium tartrates. The precipitate is formed on account of the decreasing solubility of these substances in the liquid as it becomes more alcoholic. During fermentation red Ws. tend to become lighter in colour and less astringent, due to the separation of tannin and colouring matters. The 'fining' or 'clearing' of Ws. is carried out by the addition of albumin, isinglass, gum, lime, gypsum, etc. The addition of gypsum (plastering) causes the removal of potassium bitartrate, leaving the acid sulphate of potassium which gives a dryness to the W. and increases its life. The aroma or 'bouquet' of a W. depends on the particular ethers present in the liquid. The amount of alcohol in a W. is determined by the percentage of sugar in the 'must,' one part of alcohol being produced by the fermentation of about two parts of sugar. As a rule the percentage of alcohol does not exceed 12 to 15 per cent, and such Ws. are termed natural Ws. Extraneous sugar is often added ('doctoring') to increase the percentage of alcohol, and such Ws. are then termed fortified Ws. The name 'dry' Ws. is given to Ws. in which the fermentation of the sugars is complete. If fermentation is checked before it is completed, a sweet W. is the result, while sparkling or effervescent Ws. are the result of bottling before fermentation has ceased. The qualities of a good W. are much improved by 'maturing' for sev. years. The experiments of Pasteur, however, have shown that by heating the W. to about 140° F. for a short time it is preserved from deterioration, and also takes on the properties of matured W. The colours of particular Ws. may

be due to the addition of various colouring matters. Red Ws. owe their colour to the fact that the skins of the grape are left in the vats during the first fermentation. Light Ws., such as Burgundy, claret, hock, etc., contain from about 8 to 13 per cent of alcohol, and port and sherry often as much as 24 per cent, because they have had grape spirit added. See P. M. Shand, *A Book of French Wines*, 1928; and J. B. Book of *Other Wines*, 1929; C. W. Berry, *In Search of Wine*, 1935; T. A. Layton, *Choose your Wine*, 1939; and A. L. Simon, *A Wine Primer*, 1946.

**Wineland**, see VINLAND.

**Wine Month**, see OCTOBER.

**Wines, Home-made**, are the fermented juices of fruits, cultivated or wild, or fermented sweetened extract derived from flowers, leaves, and roots. The fruits chosen are sound, ripe, clean, and dry. *Boiling* water shortens the process of making. One gallon of water is generally allowed to 7 lbs. of fruit. Very strongly flavoured, or acid fruits are given double the quantity of water per gallon (7 lb.) of fruit. The fruit is crushed and covered with cloth and left from 3 to 10 days (according to kind). Sugar from 2½ to 3½ lb. per gallon, is added and dissolved after the liquid is strained. A rough tablespoonful of brewers' yeast will aid in securing quick fermentation. The wine should be allowed to ferment in a temp. of 70° to 80° F. Fermentation is usually completed in 4 to 6 weeks if the temp. is maintained. The wine is thoroughly stirred, left for 4 days, then strained through a clean flannel bag into a cask or into bottles. New corks only should be used and placed in lightly until all sound of 'working' has ceased. Then corks should be driven in tight. The wine should be left in a cool dark place for twelve months to mature.

For the making of fruit syrup, see under PRESERVING.

**Winfrith**, see BONIFACE, ST.

**Wingate, Orde Charles** (1903-14), Brit. soldier, educated at Charterhouse and R.M.A., Woolwich; gazetted to the Royal Artillery in 1923, and served with the Sudan Defence Force, 1928-33. In Palestine he organised and led a force of soldiers and police for night operations during the Arab revolt (1936-38), and was awarded the D.S.O. in 1938 for his work there as head of the Jewish counter-guerillas. When the Second World War broke out he was selected for special service under Wavell (q.v.), as leader of the Abyssinian partisans, whose force he organised with even more marked success than in Palestine. By the time he went to Burma to organise guerilla war there he was 'the man most fitted in the Allied forces to form, train, and lead the 'Jungle Commando.' He was made a Major-General in 1942. His famous brigade of 'Chindits,' consisting of Brit and Gurkha columns with intelligence detachments from the Burma Rifles, penetrated great distances across jungle ranges and valleys. Skillfully infiltrating through the Jap. outposts and garrisons, his force penetrated hostile ter. as far as the Shan States. For

The first railway arrived from the S. in 1878, providing a link with E. Canada via St. Paul, Chicago, and Detroit. The Canadian Pacific line arrived in 1883, being completed trancontinentally in 1885. Since that time two other trans-continental lines passing through W. have been built making the city the main



railway centre of the W. Since the advent of commercial aviation, W. has become a centre of Canadian and international air traffic and is the air terminal serving N. mining developments.

W. developed rapidly after the building of the first railway lines. It is now the leading distribution centre for the West and is the headquarters for a number of large wholesale and retail houses. Together with the neighbouring city of St. Boniface (*q.v.*), W. has sev. meat-packing plants. Within the city and its various suburbs are numerous flour mills, railway repair shops, clothing, and other cloth manufacturing establs., fur processing and marketing agencies, and printing houses. In 1949 W. covered an area of 25 sq. m. and had a pop. of 231,491.

There are two extensive natural parks on the city's outskirts. W. is the seat of the Univ. of Manitoba and its affiliated colleges. The plan of the tn. is strictly geometrical: the streets are wide and straight, and spacing is good. Since 1912 the hydro-electric power resources of the W. R., 70 m. N.E. of the city, have been increasingly exploited. In 1950 heavy damage was done to the city when the Red River overflowed its banks. *See also* under MANITOBA.

**Winnipeg, Lake**, lake in the prov. of Manitoba, Canada. It has a length of 250 m., and is from 5 to 7 m. broad.

**Winnipegosis, Lake**, shallow lake in north-western Manitoba, Canada, extending into Saskatchewan. It has a length of 127 m.

**Winsford**, tn. of Cheshire, England, situated on the R. Weaver, 17 m. E. of Chester. The auct. bor. of Over, with its twelfth century church, is part of the urban dist. Salt is manuf. from vast resources of underground brine, and agriculture is another main industry. Pop. 12,000.

**Winslow**, mkt. tn. of Buckinghamshire, England, 6 m. S.E. of Buckingham. W. was the site of a palace of the kings of Mercia. The church dates from the thirteenth century, and W. Hall was built in 1700. Pop. 1500.

**Winstanley, Henry** (1644-1703), Brit. engineer, *b.* at Saffron Walden. In 1666 he became clerk of works to Charles II. He began designing the first lighthouse at Eddystone in 1696. It was finished four years later but was destroyed in a storm in 1703. *See also* EDDYSTONE LIGHTHOUSE.

**Winston-Salem**, city, co. seat of Forsyth co., N. Carolina, U.S.A. It is the commercial centre of a fertile agric. region, especially noted for its tobacco; the growth of W. is chiefly due to this industry, and the manuf. of cigarettes and flat plug tobacco here is most important. Pop. 79,800.

**Wint, Peter de** (1781-1849), Eng. landscape painter of Dutch origin and a 'little master' of the old Eng. school, *b.* in Stone, Staffordshire. He studied at the Royal Academy. De W. is best known for his water-colours of lush, tree-lined meadows by the Trent and Thames, and the city of Lincoln and its surrounding countryside.

**Winter**, fourth season of the year. It commences, astronomically, when the sun has attained its lowest declination, *i.e.* its lowest noon position in the sky. This occurs for the N. hemisphere when the sun enters Capricorn, for the S. when it enters Cancer, that is, when it is in the zenith on those tropics. The sun's rays falling at the least angle with the horizon, the temp. falls, to rise again towards spring when the sun passes its mean noon position. Climatically, W. is very varied, corresponding with a dry season usually, but in 'Mediterranean' regions with a wet season. Biologically, it is the ann. period of suspended animation for many forms of life.

**Winter, Jan Willem De**, *see* DE WINTER.

**Winter, Aconite**, *see* ACONITE, WINTER.

**Winter Berry**, or **Black Alder**, shrub (*Ilex verticillata*), of the family Aquifoliaceae, indigenous to eastern N. America, it reaches a height of six ft., and has long alternate lanceolate leaves with toothed edges, small white flowers, and red berries. The bark has medicinal properties.

**Winter Garden Theatre**, theatre in Drury Lane, London, England. In 1919 the theatre known as the Middlesex music-hall had structural alterations and was then re-opened as the W. G. T. It became famous for its musical comedies.

During the Second World War more emphasis was laid on serious drama; there was a Shakespearean season (1945-46), and such plays as *Love on the Dole*, *Saint Joan*, and *No Room at the Inn* were produced.

**Winter Green**, *see* PYROLA.

**Winterhalter, Franz Xavier** (1806-73), Ger. portrait painter, *b.* at Menzenschwand in the Black Forest. He studied painting in Munich. He had a facile, popular style, and is best known in England for his paintings of Queen Victoria and the Royal Family.

**Winter's Bark**, bark of *Drimys winteri*, an evergreen tree (family Magnoliaceae). W. B. resembles cinnamon, and is used as a tonic and as a spice.

**Winter Sports**, open-air athletic sports carried out in snow or on ice. Since the end of the nineteenth century, W. S. have been much developed and popularised. They now form a part of the Olympic Games. Switzerland is the chief site of W. S.; but others in Europe include Norway, Sweden, Germany, and Austria, and there are sites in Canada, Australia, S. Africa, and the U.S.A. *See further* under CURLING; SKATING; SKI and SKIING; SLEIGH; TOBOGGANNING.

**Winterthur**, tn. of Switzerland in the canton of Zurich, with manufs. of cotton goods, including cambric and machinery. A good wine is produced in the neighbourhood. It has some fine medieval eccles. architecture, and some good civic buildings in the baroque style. Pop. 64,500.

**Winthrop, John** (1588-1649), an Eng. colonist, governor of the colony of Massachusetts (1629-34 and 1637-49), *b.* at Eddystone, Suffolk, England, and educated at Trinity College, Cambridge, and at the Inner Temple. He sailed in the

*Arabella* from Yarmouth to America with 900 persons in 1630, and helped to found Boston.

**Winze**, *see under* MINING.

**Wiping**, *see under* SOLDER AND SOLDERING.

**Wireless**, *see* RADIO.

**Wireless Direction Finding**, *see* RADIO DIRECTION FINDING.

**Wireless Telegraphy**, system of wireless communication other than telephony. Intelligence is conveyed either by turning the transmitter carrier wave on and off in accordance with some agreed code symbols, or by keying modulation on and off to a continuous carrier, or by keying both carrier and modulation, or, finally, by carrier shift, *i.e.* moving the frequency of the carrier a few cycles for the positive code symbols above. The codes used may be the International Morse Code or 5-unit teleprinter code for direct operation of teleprinter machines.

*See also* MODULATION; *also under* POST OFFICE (TELEGRAPHS AND TELEPHONES); and TELEGRAPHY.

**Wireworm**, *see* CLICK-BEEFLES.

**Wiring, Electric**, *see* ELECTRIC LIGHTING AND WIRING OF HOUSES.

**Wirksworth**, urb. dist. and mkt. tn., Derbyshire, England, 14 m. N.N.W. of Derby; it has lead mines, stone quarries, and manufs. of tape, hosiery, and silk. St. Mary's Church dates from the thirteenth century. Pop. 4,900.

**Wirral**, peninsula of Cheshire, England. It is bounded by the Dee estuary on the E. and the Mersey estuary on the W. It includes S.W. residential suburbs of Liverpool. The coast of W. contains a number of seaside resorts. W. itself is a co. constituency and returns one member to Parliament.

**Wisbech**, mun. bor. of the Isle of Ely, Cambridgeshire, England, on the R. Nene, in the centre of an agric. and fruit-growing dist.; it has manufs. of agric. implements and engineering, beer, oil-cake, baskets, and there are tanning and preserving, timber, and printing industries. It is a port, vessels up to 2000 tons using it. There are some good examples of Georgian architecture in W. Pop. 17,400.

**Wisby (Visby)**, seaport of Sweden, cap. of Gotland Is., on the W. coast of the is. in the Baltic. St. Mary's Cathedral was founded about 1190-1225, and is still used. W. was an important member of the Hanseatic League, and gave its name to a maritime legal code of the thirteenth century. Its ruined turreted walls date from the thirteenth century. It is a favourite holiday resort. Sugar, chalk, and cement are among its exports. It became Swedish in 1648. Pop. 12,000.

**Wiscard, Robert**, *see* GUISCARD.

**Wisconsin**: 1. One of the N.-central states of the U.S.A., the 'Badger State,' was admitted to the Union in 1848. It is bounded on the N. by Michigan and Lake Superior, E. by Lake Michigan, S. by Illinois, Iowa, and Minnesota, W. by Minnesota and Iowa. The greatest length is 300 m., the greatest width 250 m., and the total area about 56,154 sq. m. It is watered by numerous rivs., notably the

Mississippi, St. Croix, Menominee, Montreal, St. Louis, and the Wisconsin. The prin. sheet of water is Lake Winnebago (*q.v.*) and around the Kettle Moraine are clustered hundreds of small lakes. The surface is generally high plain with high bluffs along the rivs. and lakes. The forest growth is dense, particularly in the N., which has a severe climate. In the S. is prairie-land. Iron and copper ore are found in the N.W., while lead occurs in the S.W. The climate generally is temperate, but is subject to extremes and in winter is very severe. The air is dry. Agriculture is a prominent industry, and the chief crops are Indian corn, hay, wheat, oats, potatoes, and barley. Tobacco (yield over 40 m. lb. annually) of excellent quality is grown successfully, and beet-sugar factories flourish. Cabbage and canning peas are grown in great quantities. W. is the leading dairy state of the Union. The output of milk is over 15,000 m. lb., of creamery butter, 80 m. lb., and of Amer. cheese, 350 m. lb. There are over 2,535,000 milch cows in the State. Enormous quantities of milk are shipped to Chicago. Grapes, apples, strawberries, and cranberries are the most important fruit crops, cucumbers are grown for pickling, and string beans for canning. The fisheries are important. Dairy products are manufactured. Until the beginning of the twentieth century W. was predominantly agric.; but over half the working pop. is now employed in industry owing to the development of hydro-electric power. There are important manufs. of motor vehicles, lumber and timber, foundry and machine-shop products, paints and varnishes, meat-packing, knitted goods, furniture, boots and shoes, rubber tyres, electrical machinery and supplies, and leather. Milwaukee is a large port and a great manufacturing centre, with hosiery and textile mills, tanneries, soap, and candy factories, etc. The system of education is especially good in W. The Univ. of W. is at Madison. It was estab. in 1848 and specialises in scientific farming and dairying. The Wisconsin Institute of Technology (School of Mining) is at Platteville. Transportation is good and sev. railways feed the State. There are good air communications. Early settlement was hindered by continual wars with Indians, and the first white man to enter the State was Jean Nicolet, who came there in 1634. The growth of the pop. is steady, and in 1948 it was 3,309,000. Madison is the cap., pop. 67,400; other important cities: Milwaukee, 587,400; Racine, 67,200; Kenosha, 63,500; Green Bay, 46,200; La Crosse, 42,700; Sheboygan, 40,600; Oshkosh, 39,000. 2. Chief riv. of the interior of Wisconsin, U.S.A., rising in Lake Deserit on the Michigan boundary, and flowing S. and S.W. past Portage City to join the Mississippi near Prairie du Chien. A canal connects it with Fox R. and Lake Michigan. Length about 600 m., navigable to Portage.

**Wisden Cricketer's Almanack**, ann. handbook dealing with cricket and cricketers. It was first issued in 1864

by John Wisden (1826-84), a cricketer and sports outfitter. It records all scores, averages, and descriptions of first-class matches played in the preceding year and all overseas tours of the penultimate season. There are summaries of important public-school and second-class co. matches. Historical details and statistics cover every aspect of the game, and other articles include the *Five Cricketers of the Year*.

**Wisdom, Book of**, see ECCLESIASTICUS; PROVERBS, BOOK OF; SOLOMON, THE WISDOM OF.

**Wiseman, Nicholas Patrick Stephen** (1802-65), Brit. Rom. Catholic prelate, b. at Seville. His father was descended from an anct. Eng. family, but had settled as a merchant in Waterford. W. was educated for the priesthood at Ushaw and in Rome, and became rector of the Eng. college at Rome. He was nominated archbishop of Westminster by the pope in 1850 and also made a cardinal. W. was a great social reformer, as well as a learned scholar, and did much to further the revival of Rom. Catholicism in England. He was one of the founders of the *Dublin Review* and contributed to it. See lives by W. Ward, 1897, and D. Gwynn, 1929.

**Wise, Thomas James** (1859-1937), Brit. bibliophile and literary forger. His extensive forgeries of 'rare originals,' perpetrated over half a century, were exposed in 1934. See W. Partington, *Thomas J. Wise in the Original Cloth*, 1947. See further under LITERARY FORGERIES.

**Wishart George** (c. 1513-46), Scottish Protestant martyr and reformer. He was early accused of heresy in Scotland, and then travelled on the Continent. He returned to Scotland (1543), preaching Lutheran doctrines and found ardent supporters. Through the enmity of Cardinal Beaton, W. was arrested at Ormiston (1545), and burnt at St. Andrews on a charge of heresy.

**Wishaw**, in Lanarkshire, Scotland, 3 mi. from Motherwell, with which it became amalgamated to form a joint burgh in 1920. There are vast blast furnaces, iron and steel engineering, and railway wagon works. Preserves, confectionery, and textiles are manufactured. Pop. (with Motherwell) 70,500.

**Wisla**, see VISTULA.

**Wistaria**, genus of leguminous climbing plants, including *W. chinensis*, the Chinese kidney bean, a popular variety grown on walls, trellis, or garden arches. It has long leaves broken up into sev. pairs of oval leaflets, covered with silky down, and bearing blue flowers growing in long terminal racemes. *W. japonica* is a white variety.

**Wit** (A.-S. *witian*, to know), originally meant simply intelligence and the power to know. In the plural, this meaning has remained, but the singular form has changed its sense to quickness of mind, thence to the power of joining ideas in an unusual and humorous way, until now W. is almost synonymous with humour and satire. Strictly speaking, it is not essentially humorous; Hazlitt remarked

that lying was a species of W. It is the power to make an intelligent remark arising out of the situation or circumstance; the fact that such apt remarks are usually humorous has led to the narrower meaning, i.e. humorous repartee. Since the time of Pope, England has been rich in recorded and transcribed W., from Boswell's meticulous reporting of Johnson to the many legends now being built around Bernard Shaw.

**Witchcraft** includes, broadly, any claim to a power to produce effects by compact with a supernatural power. Modern anthropologists believe W. had its origin in a fertility cult or group of cults indigenous to Europe since paleolithic times, i.e. since the pre-agric. era; its chief festivals were held at Candlemas, May Eve, Lammas, and Nov. Eve, all seasons more fateful to a hunting or pastoral people than to peasants. The few direct accounts of its ritual which survive show that a horned god symbolising the fertility of cattle, sheep, goats, or occasionally deer, was venerated, and that the local leader of the cult impersonated, and was regarded as, the incarnation of this god. This explains Christian traditions of a 'devil' with horns and tail. Such ceremonies are depicted in the paleolithic cave-murals of Altamira, Arriège, etc. As the objects of the seasonal rites was to promote fertility by sympathetic magic, so the adepts of the cult were deemed able to produce any natural effect by similar but opposite means—especially sterility and death. In the course of time the original cult received the accretion of discarded beliefs from other cults which tended to obscure its origins. This happened both with relation to the Aryan 'sky-father-gods' (e.g. Jupiter, Odin) and Christianity, which were successively embraced by the governing class in W. Europe, leaving W. as the religion, progressively more debased, of more and more humble social strata. At times it appears to have coalesced with Christian heresies (e.g. certain deviations of the Catharists) and occasionally to have attracted distinguished followers from the ruling Christian class. Possible examples are Wm. Rufus, and Gilles de Rais, the patron of Joan of Arc (who was accounted a witch).

By the time of the Reformation, W. had assumed its final form as a secret society organised in 'covens' or groups of thirteen members of both sexes, of which the leader was always a man. By this time it is unlikely that there were many mentally normal people who believed in the cult. As members of a secret society 'witches' could equally easily be denounced on charges of treason, heresy, or demonism. Eng. laws against witches are known from the time of Canute, and eccles. and secular courts had concurrent jurisdiction in cases of W. The former punished by penance and fine up to 1542, when W. was made a common felony (it was already indictable at common law). Written evidence concerning W. trials as far back as the Middle Ages is copious but must be read with extreme care. Very frequently it was taken down by

persons who did not understand the implications of what the accused and witnesses said. The earliest reported trial in England before a secular court was in 1324; in that year occurred the famous trial before the bishop of Ossory of Dame Alice Kyteler (*consult* report by Thomas Wright in the pubs. of the Camden Society). Apart from the statutes passed in 1542 and 1562, the Act of 1601, defining and prescribing the punishment for W., remained the prin. Act concerning W. up to the Act of 1736. Under all these Acts the prosecution had to prove that injury to person or property had been done or attempted (but not in the case of love philtres), or that gain had been made. Trials for W. were most numerous in the seventeenth century, when the final crisis of W. in Britain took place.

By the time of Queen Anne, organised 'covens' of witches had ceased to exist, and the public attitude towards them became less violent, not so much because people became more enlightened but because the element of fear had diminished, the surviving witches being so obviously either mentally or physically impotent for good or harm. The last recorded conviction in England was that of Jane Wenham of Walkern in Hertfordshire (1712), but a woman was actually burned alive in Sutherland as late as 1722. (For Continental trials *consult* J. Scheltema, *Geschiedder Hexenprocessen*, Haarlem, 1828; and for Scottish, R. Pitcairn's *Criminal Trials in Scotland*, 1833.) As the law now stands any person pretending to use W., tell fortunes, etc., may under the Act of 1736 be imprisoned for a year. Proceedings may also be taken under the Vagrancy Act of 1821 (*see* VAGRANTS).

*See* Erastus, Bodinus, V. Polydorus and F. Hieronymus, *passim*; R. Scot, *Discoverie of Witchcraft*, 1584; Ponzimbis, *de Lamiis*, 1592; Wierus, *De Lamiis*, 1597-79; H. Boquet, *Discours des sorciers*, 1603; Ganeus, *Compendium de Maleficiis*, 1626; T. Potts, *Discovery of Witches in the County of Lancashire*, 1815; works by S. Cigogha, 1607, and J. Glanvill, 1688; Margaret A. Murray, *The God of Witches*, 1921, and *The Witch Cult in Western Europe*, 1933; H. Ross Williamson, *The Arrow and the Sword*, 1947; R. Trevor Davies, *Four Centuries of Witchcraft Beliefs*, 1947; and R. Graves, *The White Goddess*, 1948.

**Witch Doctor, or Medicine Man**, practitioner of the healing art and cognate mysteries in primitive culture, particularly in tropical Africa and Melanesia. Generally holding himself aloof from the rest of the people after prolonged initiation, the W. D., effects his quack cures or crude surgical operations against a background of primitive magic.

**Witch-Hazel**, genus *Hamamelis*: specifically *H. virginica*, N. Amer. shrub resembling the hazel. It is a shrub between 8-12 ft. high, with oval leaves and clusters of yellow flowers, blooming in autumn and winter, whence the alternative name Winter Bloom. The bark and leaves have an astringent property useful in medicinal preparations.

**Witenagemot** (Saxon *witan*, to know, and *gemoth*, assembly), in Anglo-Saxon times the national Council, consisting of members of the royal family, the arch-bishops, bishops, abbots, ealdormen, and king's thanes. Its origin is obscure. Stubbs considered that it derived from the Teutonic assembly of freemen described by Tacitus. In practice its members varied from a score to a hundred; but in theory, if the W. had (as is disputed) a popular origin, it is probable that all freemen may originally have been entitled to attend. The *de jure* powers of the W. were very great, but were practically limited by a strong king or ruling clique.

**Witham**: 1. Tn. and urb. dist. of Essex, England, on Brain R. There are anct. earthworks round the church of St. Nicholas, which contains interesting monuments. Industries include the manuf. of metal windows, gloves, fruit juices, and oxygen; there is milling and seed-growing. Pop. 6000. 2. Riv. rising in Rutland, England. It flows past Grantham and Lincoln, and then S.E. past Tattershall and Boston into the Wash above Welland R.

**Witness**, *see* EVIDENCE, OATH.

**Witney**, mrkt. tn. and urban dist. of Oxfordshire, England, on the Windrush, 10 m. from Oxford. It is famous for blanket making. It also manufs. gloves and other woollen goods. Among its fine public buildings are a thirteenth-century cruciform church (restored 1867), the grammar school (1683), and Blue Coat School (1723). The small roofed open-air shelter known as the Butter Cross which stands close to the tn. hall replaces the old Butter Cross which formerly stood on this site. An inscription on it states that it was erected in 1683 by Wm. Blake, a Cogges gentleman. It was provided with a sun-dial which is still there. A clock has been added more recently. *See* lists, of W. by J. A. Giles, 1852, W. J. Monk, 1891, and P. L. Collignon (in publication) Pop. 18,800.

**Witt**, Cornelius, and Jan De, *see* DE WITT.

**Wittenberg**, tn. of Saxony, Germany, on the Elbe, about 59 m. from Berlin. The famous univ. founded 1502) was incorporated with that of Halle (1817). The Court of the Augustum (theological seminary) contains Luther's house, and that of Melancthon is near by. Luther preached in the Stadtkirche and to the doors of the Schlosskirche affixed his ninety-five theses against indulgences and other doctrines. Pop. 26,000.

**Witwatersrand**, full name of the dist. in the Transvaal, S. Africa, known for its gold-fields, usually known as the Rand (*q.v.*) It is also more exactly applied to the ridge which contains the gold reefs.

**Wiveliscombe**, mrkt. tn., and par. of Somersetshire, England, 11 m. from Taunton. There are ruins of a fourteenth-century episcopal palace. It is an agric. centre. Pop. 1200.

**Woad**, or *Isatis tinctoria*, cruciferous herb, with yellow flowers and pendulous pods. It was formerly cultivated extensively for the blue dye which it yields by

fermentation of the leaves, and is still grown to a small extent. The dye was used by the auct. Britons.

**Woburn**, mkt. tn. of Bedfordshire, England. It contains Woburn Abbey, the seat of the earls and dukes of Bedford (since 1547), on the site of a Cistercian abbey (1145), the present building dating from 1744. The abbey stands in W. Park, and has a valuable art collection. Straw-plaiting was formerly carried on here. Pop. 900.

**Woburn Sands**, par. of Buckinghamshire, England, 4 m. N.E. of Fenny Stratford, in the rural dist. of Newport Pagnell. It stands 500 ft. above sea level on sandy, pine-covered hills, and is a well-known health resort. Pop. 1100.

**Wodehouse, John**, see KIMBERLEY, JOHN WODEHOUSE, FIRST EARL OF.

**Woden**, see ODIN.

**Woffington, Margaret**, or **Peg** (c. 1714-60), Irish actress, *b.* in Dublin. She played in Dublin from 1732 to 1740. Her London debut was at Covent Garden under Rich in *The Recruiting Officer* (1740). She excelled in comedy as a lady of high rank (Lady Plyant, Lady Betty Modish, Millamant, etc.), but also acted in tragedy. See T. Taylor and C. Roade, *Masks and Faces*, 1852; C. Roade, *Peg Woffington*, 1853. See also lives by J. P. Molloy, 1884, and J. A. Daly, 1888.

**Wohler Test**, see METALLURGY (METAL TESTING).

**Woking**, urb. dist. of Surrey, England. The London Necropolis Cemetery (1864) is at Brookwood (4 m. distant), and Crematorium (1878), at St. Johns (2½ m.). There is a Moslem Mission and Literary Trust which includes a mosque (1889). Near by are Inkerman Barracks, a Mental Hospital, Children's Orthopaedic Hospital, and Railway Orphanage. There are printing and light industries. It is a part of constituency. Pop. 17,100.

**Wokingham (Oakingham or Oockingham)**, municipal bor. of Berkshire, England, bordering on Windsor Forest. There are an auct. par. church, a Gothic tn. hall (1860), and the famous Rose Inn, where Pope, Swift, Gay, and Arbuthnot composed the ballad of *Molly Mog*. Some of the almshouses date from 1151. W. was noted for bull-baitings till about 1821. Pop. (estimated) 8500.

**Wolcot, John** (1738-1819), Eng. satirist, *b.* near Kingsbridge, Devon. He studied medicine at Aberdeen Univ. He wrote satires and lampoons under the pseudonym of 'Peter Pindar,' which were popular in his day.

**Wolf, Friedrich August** (1759-1824), Ger. classical philologist and critic, *b.* at Hagenrode, near Nordhausen. He studied at Göttingen, having been influenced in his interest—antiquity—by Ilake. At Göttingen he came into contact with Heyne. Though W. gave the best of his energies to the work of personal teaching, his literary production was great. In 1782 he pub. an annotated edition of Plato's *Symposium*, and this was the first of many editorial labours. He was one of the initiators of the scientific study of philology. See studies by W. Körte, 1833; O.

Kern, 1924; and S. Reiter (3 vols.), 1935.

**Wolf, Maximilian Franz Joseph Cornelius**, always known as **Max Wolf** (1863-1932), Ger. astronomer, *b.* at Heidelberg. He studied at Heidelberg and later Stockholm where he took mathematical astronomy under Gylden. While still a student he discovered in 1884 the comet that now bears his name. He was the first to apply photography to the discovery of asteroids and about 1300 of these bodies were found by him.

**Wolf, Rudolf** (1816-93), Swiss astronomer, *b.* at Zurich. He is famous for his work on sunspot cycles. He confirmed the work of Schwabe (*q.v.*) on the 11 year period and afterwards fixed it more accurately at 11.1 years. In 1859 he estab. the connection between sunspots and terrestrial magnetic cycles, and also between the aurora and solar disturbances.

**Wolf**. The various species of W. are included with the dogs, jackals, and foxes in the genus *Canis* of the family *Canidae* in the order *Carnivora*. The Ws., dogs, and jackals are all closely similar, and are distinguished from the foxes by some characteristics of the skull. The European W., *Canis lupus* (*Lupus vulgaris*) was widespread in Gt. Britain in Saxon times; it persisted in England until the reign of Elizabeth, and even later (1743) in Scotland and (1770) in Ireland. Its present distribution is Europe, N. Asia, and N. America. Other Ws. are *Canis pallipes* of India, *Lupus mexicanus* of the Southern states of N. America, and *Lyciscus cogotius*, the coyote of Mexico. The Dingo, *C. dingo*, is a destructive W. or dog of Australia; whether it is indigenous or was introduced by the natives is not known with certainty. The Frame W. or Coyote is *C. latrans*; the jackals are *C. aureus* and *C. anthus*.

**Wolf, Tasmanian**, see THALASSINE.

**Wolfe, Humbert** (1885-1940), Eng. poet and critic, *b.* in Milan of Jewish descent, and educated at Bradford Grammar School, and Wadham College, Oxford. He entered the Civil Service in 1908 and was prin. assistant secretary at the Ministry of Labour from 1918. He was made C.B. in 1925. His poetic works include: *The Unknown Goddess* (1925), *Humoresque* (1926); *News of the Devil* (1926); *Requiem* (1927); *The Silver Cat* (1928); *The Blind Rose* (1928); *The Uncollected City* (1930); *Early Poems* (collected) (1930).

**Wolfe, James** (1727-59), Eng. soldier, *b.* at Westerham, Kent, and educated at Greenwich. He joined the army in 1741, he and his brother, Edward, taking part in the battle of Dettingen (1743). In 1745 W. now a lieutenant, was sent to Scotland under Cumberland to assist in crushing the rebellion in support of the Young Pretender. During the Seven Years' War, W. had charge of Britain's operations in America under Amherst. In 1758 the task was assigned to W. of taking Louisbourg, and this he accomplished successfully in July. In 1759 he was given the command of the expedition against Quebec, and on June 26 began the twelve

weeks' siege. The first attempt at assault on July 31 failed. Later, by distracting the attention of the Fr. by surprise attacks in other quarters, and by using an unguarded path, W. in a night assault succeeded in placing an army on the heights called the Plains of Abraham. Marquis de Montcalm, the Fr. commander, at once gave battle. The Eng. were victorious, and W., three times wounded, died in the hour of victory. See lives by B. Willson, 1909; W. T. Waugh, 1929; F. E. Whitton, *Wolfe and North America*, 1929. See also CANADA; SEVEN YEARS' WAR.

**Wolfenbüttel**, tn. of the former Brunswick duchy, Germany, on the Oker, 8 m. from Brunswick. The library, built in imitation of the Rom. Pantheon (1723), where Lessing was librarian (1770-81), was transferred to a new Renaissance building (1887). W. is noted for its steel-works, and manufs. of machinery, leather, cork, and copper goods, preserves, cloth, and tobacco. The Swedes defeated the Austrians here in the Thirty Years' war (1641). Pop. 19,600.

**Wolfgang**, *Saint* (924-994), Ger. saint, b. in Swabia and educated at Reichenau monastery. He became a Benedictine at Einsiedeln, and made the abbey school there very famous. In 972 he became bishop of Ratisbon. He restored abbeys, raised the standard of education, and reformed eccles. discipline.

**Wolffgang, Russian**, see BORZOV

**Wolffhound**, Irish, see IRISH WOLF-HOUND.

**Wolfram**, mineral from which the metal tungsten (*q.v.*) is extracted. (Chemically, it is a mixture of iron tungstate ( $\text{FeWO}_4$ ) and manganese tungstate ( $\text{MnWO}_4$ ); it is widely distributed, frequently occurring with tin-ore. The chief localities are Malaya, Spain, Australia, Colorado, and Tasmania.

**Wolframite** ( $\text{FeMnWO}_4$ ), mineral of tungsten, occurring in dark-brown to black crystals, with yellow-brown to black streaks, varying from iron tungstate to manganese tungstate. It is found in China, the States of Malaya, Burma, and Cornwall.

**Wolfram von Eschenbach** (c. 1170 c. 1220), Ger. poet or minnesinger. He was the greatest poet before the revival of Ger. literature, and his *Parzival* (c. 1205), (on which Wagner based his opera), tells of the quest for the Holy Grail.

**Wolf Rock**, rock about 117 ft. high, 8 m. from Land's End, Cornwall, England, with a lighthouse.

**Wolf'sbane**, see ACONITUM

**Wollaston**, William Hyde (1766-1828), Eng. natural philosopher and chemist, b. at E. Dereham, Norfolk, and educated at Charterhouse. He took his medical degree at Gt. Ouse College, Cambridge. Later he turned his attention to chemistry, particularly in connection with platinum, palladium, and rhodium, and to optical invention. He received the medal of the Royal Society for his method of manufacturing platinum and rendering it available for instruments (particularly crucibles). He is noted as the inventor

of the camera lucida and the goniometer, and for the discovery of dark lines on the solar spectrum, 1802.

**Wollongong**, city of New S. Wales, Australia, situated on the coast about 51 m. S. of Sydney. It is the prin. residential area and business centre of the Illawarra dist. (*q.v.*). There are sev. rapidly expanding industries in the neighbourhood, including iron and steel, copper, fertilisers, oxygen and acetone, boat building, and coal mining. Greater W., embracing W., N. Illawarra, Central Illawarra, and Bulli has a total pop. of 63,000.

**Wollos**, see under GALLAS.

**Wollstonecraft, Mary**, see GODWIN, MARY WOLLSTONECRAFT.

**Wolseley**, Garnet Joseph Wolseley, Viscount (1833-1913), Brit. soldier, b. at Golden Bridge, co. Dublin, of an old Staffordshire family. He was educated privately, and entered the army in 1852. A long career of active service commenced with the Burmese War of 1853. He served in the Crimea, with the 90th Light Infantry. He was present at the relief of Lucknow and at other engagements in the Indian Mutiny, becoming lieut.-col. at the close of the war. He commanded the Canadian Red R. expedition of 1870, and took part in the Ashanti War of 1873, receiving the thanks of Parliament. In Egypt he won the Battle of Tel-el-Kibir in 1882, and commanded the expedition which attempted to relieve General Gordon in 1884-85. He became commander-in-chief in Ireland in 1890, was made field-marshal in 1894, and from 1895 till 1900 was commander-in-chief of the forces. Viscount, 1887.

**Wolsey**, Thomas (c. 1475-1530), Eng. cleric and statesman, b. in Ipswich, the son of a grazier, and said to have been educated at Magdalen College, Oxford. He took holy orders, was presented to the living of Limington in 1500, and in the next year was appointed domestic chaplain to Henry Deane, archbishop of Canterbury. Henry VII. made him one of his chaplains in 1507, and preferments followed rapidly. He was made dean of Lincoln in 1509, canon of Windsor in 1511, dean of Hereford in 1512, and of York the next year, bishop of Lincoln in 1514, and later in the year archbishop of York. Leo X. created him a cardinal in 1515. He had for some time been in the confidence of Henry VIII. and had been consulted by the king on temporal matters. It was said that his magnificence outshone the king's, and that, as lord chancellor, he made the Star Chamber more important than the king's court; but in fact it seems that he was always the adviser, and never the dictator, of the young monarch. He directed the plan of campaign against France in 1512, arranged the treaty of 1512 with that country and accompanied Henry to the Field of the Cloth of Gold. In 1520, when Charles V. became Holy Roman Emperor, W. reversed his policy of alliance with France, and, in 1521, entered into an alliance with Charles against Francis, who was defeated at Pavia. W.'s policy was in fact purely

opportunist, the constant factor being his wishes to make Eng. influence felt abroad, and to satisfy his own ambition by gaining the papal throne, in which position he would also be able to influence international events in England's favour.

Though opposed to Anne Boleyn, W. conducted negotiations with Clement VII. for Henry's divorce from Catherine of Aragon (1527) and sat as a judge at the hearing with Campeggio. His failure to solve this question satisfactorily led to his fall from favour. He was indicted in 1529, but pardoned the following year. In the last year of his life he was arrested for high treason, and died on his way to London to refute the charge. W. was undoubtedly arrogant and avaricious, while his diplomatic triumphs were short-lived and gained at immense cost. He was, however, a good organiser, and dispensed justice in his courts with a fairness which won him enemies among the rich. He was a patron of learning: his foundation, Cardinal College, at Oxford, became Christ Church. Though personally worldly, he attempted to make administrative reforms in the church, and, after his fall from power, administered his diocese of York carefully and well. See lives by M. Creighton, 1888, and A. F. Pollard, 1929.

**Wolsingham**, tn. of Durham, England. In an agric. dist., it has steel works and stone quarries. Pop. (estimated) 3000.

**Wolstan**, see WULSTAN.

**Wolstanton**, tn. of Staffordshire, England, about 1 m. from Newcastle-under-Lyme, with which it was amalgamated in 1931.

**Woluwe-Saint-Lambert** (Flemish *Sint-Lambrechts-Woluwe*), E. suburb of Brussels, Belgium, with a very old church, having a Romanesque steeple. Pop. 26,300.

**Woluwe-Saint-Pierre** (Flemish *Sint-Pieters-Woluwe*), E. suburb of Brussels, Belgium. Market gardening is carried on. Pop. 18,400.

**Wolverhampton** (Handone, *Wulfrunhamton*), co. and parl. bor., second largest tn. in Staffs, England, 13 m. N.W. of Birmingham. St. Peter's Church was founded in 994 and certain of its present structure dates partly from the thirteenth century. Public buildings include the museum, public library, Bantock House museum, school of art and crafts, and the magnificent civic hall opened in 1938. The grammar school was founded in 1515. W. is referred to as the cap. of the 'Black Country' and is essentially an industrial tn., situated on edge of a rich agric. area and contiguous to some of the most beautiful countryside in the Midlands. Looks and keys have been a special manuf. from early times, and the tn. has a great diversity of industry including pneumatic tyres, rayon, aircraft and components, trolley buses and commercial vehicles, marine, diesel and petrol engine, also batteries, ball and roller bearings, bicycles, castings, electrical and heavy engineering, machine and edge tools, stampings, forgings, pressings, motor cycle and car components, hollow-

ware, chemicals, and safes and strong-rooms. There are collieries on the fringe of the city. Two members are returned to Parliament. Pop. 159,100. See T. Brennan, *Midland City*, 1949.

**Wolverine**, see GLUTTON.

**'Wolverine State'**, see MICHIGAN.

**Wolverton**, tn. of Buckinghamshire, England, near the Ouse, and on the Grand Union Canal. It has railway carriage and wagon shops and printing works. Pop. 13,400.

**Womb**, see UTERUS.

**Wombat** (*Phascogalemys wombat*), burrowing marsupial of S. Australia and Tasmania. It is about 3 ft. long, with a short tail and a clumsy form. It has stout limbs and a blunt muzzle and the coat is thick with long and coarse brownish-grey woolly hair. The head is large, flat, and broad, and the W. has small eyes and ears; fore-feet with five and hind-feet with four digits; soles broad and naked. The pouch is more towards the rear of the body than is usual in the marsupials, the young hanging between the hind legs of the mother. The dentition resembles that of the Rodentia. The W. is nocturnal in its habits, feeds on vegetables, digging up roots with its claws.

**Wombwell**, urb. dist. and tn. of the W. Riding, Yorkshire, England, with extensive coal mines. Pop. 11,200.

**Women's Services**, see AUXILIARY TERRITORIAL SERVICE; NURSING; QUEEN MARY'S AUXILIARY CORPS; RED CROSS; WOMEN'S LAND ARMY; WOMEN'S ROYAL AIR FORCE; WOMEN'S ROYAL NAVAL SERVICE; WOMEN'S VOLUNTARY SERVICES; etc.

**Women's Army Auxiliary Corps**, see QUEEN MARY'S ARMY AUXILIARY CORPS.

**Women's Auxiliary Air Force**, see WOMEN'S ROYAL AIR FORCE.

**Women's Institutes**, organisation of country women for the 'improvement and development of rural life.' The movement is rural and W. Is are normally only formed in communities having a pop. of under 4000. The headquarters of the National Federation of W. Is gives help and advice through the county federations, while the actual running of the institute is in the hands of the members themselves. The programmes include talks, demonstrations, competitions, and discussions. Meetings are held monthly and the members decide on their programme of work. In Scotland there is a similar but quite independent organisation and the title 'Rural Institutes' is used.

**Women's Land Army**. A W. L. A. was founded during the First World War in 1917 under the Directorship of Dame Mabel Talbot. 18,000 women and girls were enrolled and undertook all kinds of agricultural work. In May 1939 W. L. A. Co. Committees in England and Wales were appointed by the Minister of Agriculture and Fisheries and on the outbreak of the Second World War the organisation came into being. It was administered by the Ministry of Agriculture and Fisheries with Lady Denman, D.B.E., as Honorary

Director. The Scottish W. L. A. was administered by the Dept. of Agriculture for Scotland. The W. L. A. Organisation was responsible for the recruitment, training, and placing in employment of Land Girls, for their welfare and accommodation, and for the provision of their uniform. Volunteers were originally enrolled for the duration of the war and did every kind of agricultural and horticultural work, including forestry. The peak strength of the W. L. A. was 80,000 members in Aug. 1943.

**Women's Royal Air Force** (formerly **Women's Auxiliary Air Force**), existed in the First World War as the Women's Royal Air Force and was re-formed as the Women's Auxiliary Air Force (W.A.A.F) in June 1939. Three years later the W.A.A.F. had been taught and were performing skilled work in more than eighty trades, in most of which women were never employed before the war. The strength of the force was approximately 182,000 at its highest. It was an integral and indispensable part of the R.A.F. In the summer of 1940 the W.A.A.F. co-operated with the R.A.F. in winning the Battle of Britain. During this battle, women working at the plotting tables or as telephonists at Fighter Stations were exposed to the same dangers as men. The W.A.A.F., which became the W.R.A.F. in Feb. 1949, continued on a voluntary basis as a permanent feature of the armed forces.

**Women's Royal Naval Service.** The W.R.N.S. came into existence in 1939, taking its name from an earlier organisation estab. between 1917 and 1919. Throughout the Second World War this Service performed valuable duties ashore releasing men for service afloat. Such duties included administrative, domestic, secretarial, and cypher work. 'Wrens' were employed in the various communications depts., in meteorology, air radio, plotting, and many other spheres.

On Feb. 1, 1949, the W.R.N.S. became estab. as a permanent and integral part of the naval service, not subject to the naval discipline act, but having a disciplinary code of their own. The number allowed for in the 1919-50 estimates was 7200.

**Women's Royal Army Corps**, from Feb. 1, 1949, title of the Auxiliary Territorial Service (*q.v.*).

**Women's Suffrage.** Bills on W. S. passed second readings in the Commons six times between 1886 and 1911, but never proceeded beyond that stage. The debate in 1913 on the amendments to the Gov. Franchise Bill of 1912 was the last occasion on which W. S. was before Parliament prior to the First World War. This period was marked by the organised violence of women in the 'suffragette' movement, which was abruptly terminated by the outbreak of war in 1914. Owing to the work performed by women during the First World War, opinion on the extension of the franchise turned in their favour. In Oct., 1916, a conference was appointed to consider the franchise question and by a majority recommended that some

form of W. S. should be conferred. Early in 1918 a Bill granting limited franchise to women was passed and ten years later, May 23, 1928, the Bill which equalised the franchise passed the House of Lords.

In the U.S.A. the struggle for W. S. was long-drawn, but finally women over twenty-one were given the vote on the same terms with men. For many years there had been organisations to obtain W. S. The initial success came in 1869, when Wyoming, then a ter., gave women the suffrage. In 1893 the State of Colorado followed. Then followed, in turn, Utah, Idaho, and Washington. On June 4, 1918, the national Congress submitted a W. S. amendment to the constitution for action by the States. This became law in 1920.

W. S. has been granted at different times in different countries, *e.g.* Norway granted W. S. in 1912; Belgium in 1948.

**Women's Voluntary Services.** Brit. association, formed in June 1938 at the request of the Home Secretary to stimulate the enrolment of women in A.R.P. services. During the Second World War, the scope of its work was extended to all civil defence services and to help with evacuees, bombed people, the Services, etc. In 1950 there were 15,000 W.V.S. centres in local authority areas in England, Scotland, and Wales. Members of the association give whole or part-time voluntary service to gov. depts., local authorities, and local communities.

'Wonder State,' see ARKANSAS.

**Wood (or a Wood), Anthony** (1632-95), Eng. antiquary, *b.* at Oxford, and studied at Merton College. Dugdale's *Antiquities of Warwickshire* roused him to attempt the same task for Oxfordshire, and after six years' labour he produced *History and Antiquities of the University of Oxford*. He worked further at *Athenæ Oxonienses*, continuing Fell's idea. See L. Powys (ed.), *Life and Times of Anthony a Wood*, 1932.

**Wood, Edward Frederick Lindley**, see HALIFAX, VISCOUNT.

**Wood, Ellen** (better known as **Mrs. Henry Wood**) (1814-87). Eng. novelist, *b.* at Worcester. She contributed to the *New Monthly Magazine*. She won a prize offered by the Scottish Temperance League for her novel, *Danvers House*, in 1866, and in the following year *East Lynne* at once estab. her as a popular writer. See lives and studies by C. W. Wood, 1894; and A. Sergeant, 1897.

**Wood, Sir Henry Joseph** (1869-1944), Eng. musician and conductor, *b.* in London. He received musical instruction from his mother. He was assistant-organist at St. Mary's, Aldermanbury, in 1879, and St. Sepulchre's, 1882; and organist at St. John's, Fulham, 1886. He had general musical training at the R.A.M. and benefited from the experience of accompanist to the operatic class, and to the great teacher Manuel Garcia. He gave organ recitals at exhibitions in 1883-89. He first conducted the Rousby Opera Co. in 1889, and afterwards, for Marie Roze, the Carl Rosa Opera Co., and other opera and concert organisations in



London and the provs. W. was engaged by Robert Newman (1895) for Queen's Hall promenade concerts; thereafter he was continually identified with concerts there. He also conducted festivals. He visited America in 1904, 1925, and 1926. Between 1895 and 1919 he produced over two hundred Eng. works, many for the first time, and in addition Eng. people owe to W. much of their knowledge of the modern Russian, Ger., and Fr. schools. W. undoubtedly did more than any of his contemporaries to foster a real appreciation of orchestral music, and of the leading musicians of his time. He enjoyed great popularity and before he had approached his jubilee he had become a national figure. His *Memoirs, My Life of Music*, were pub. in 1938.

**Wood**, in the widest sense, is all that part of a plant that exists between the pith and the bark; in a narrower sense, it is applied only to those bundles of tissue which are called woody tissue. See also **TIMBER**.

**Woodbine**, name formerly given to twining and climbing plants, including ivy. Shakespeare used it of the honeysuckle (*q.v.*) but it is also applied to *Polygonum convolvulus*.

**Woodbridge**, urb. dist. and mkt. tn. of Suffolk, England, at the head of the Deben estuary. W. possesses a number of historical buildings, including the Shire Hall, erected in 1570, windmills, a tide mill, and the par. church of St. Mary, which was rebuilt in 1450. The tn. was once a centre for rope-making, sail-cloth making, and ship-building, but present industries are those of boat-building, small factories, and horticulture. Pop. 5700.

**Wood-carving**, see **CARVING**.

**Woodchuck** (*Arctomys monax*), popular name of a species of Amer. marmot. It is a small burrowing rodent, 15-18 in. long; grizzled above and reddish below. It has a stout body, broad flat head, and short thick legs, and is easily tamed.

**Woodcock** (*Scolopax rusticola*), a lit. game bird, much valued for the table. The majority occurring in Britain are migrants, arriving chiefly in Oct. It belongs to the long-billed section of the Snipes, in which the culmen is longer than the tarsus. They have a large eye, placed well back in the head, so that its hinder margin is just above the orifice of the ear. The wing is more rounded than in the Snipes. It has 12 tail-feathers and the tail is feathered to the dorsal joint. The Amer W. is *Phibola minor*.

**Woodcuts**. The art of the woodcut consists of cutting from the surface of a plank of wood, with a short bladed knife and gouges, the white portions of a design, leaving untouched those parts which are to print black. Proofs are taken by coating the untouched surface of the block with printer's ink and then, either in a printing press or with a burnisher, pressing a sheet of paper against the inked surface. Unlike engraving or etching on copper, in which the ink is pressed into the lines and the surface of the plate wiped clean so that the lines alone print black, in W. it

is the surface from which prints are taken, the lines showing white. Chestnut, pear, and other even-grained woods are most suitable.

Blocks of wood cut in this way were first used for printing on fabrics. The earliest extant examples on paper are believed to date from the ninth century in China and from A.D. 1418 in Europe. The sixteenth century W. of Durer and Holbein show an almost miraculous craftsmanship. Cutting on the plank, however, is most suited to simple and broad effects of strong blacks and white; where detail and delicacy of tone are required, wood-engraving (*q.v.*) is the appropriate medium.

**Woodcuts**, hamlet of Dorset, England, 6 m. from Cranborne. Excavations (1884-90) proved it to be a pre-Rom. site and a Romano-Brit. settlement. Iron and bronze utensils, Samian pottery, and Rom. coins were found.

**Wood-engraving**. Though closely allied to woodcuts (*q.v.*), Ws. differ from them in that, instead of the design being cut with a knife on the side grain of the wood, they are engraved with gravers on the end grain of a cross section of the tree. Box-wood is the timber most in favour, having a grain that is close, even, and hard. The small wedge-shaped gravers used for the work vary in section, to plough out different thicknesses of line. They are known by such names as tint tools, spitsticks, scaupers, etc. The term woodcut to-day has come to be used rather loosely to denote either work with a knife or with a graver, but strictly speaking it should apply only to the former. The chief advantage of engraving over cutting is that it offers infinitely greater possibilities for fine lines and details. Whereas it would be technically possible to facsimile a cut by an engraving, it would be quite impossible to reproduce the detail of an engraving with the knife.

Although Thomas Bewick of Newcastle-upon-Tyne (1753-1828) did not invent the process of end grain engravings (as is sometimes thought), he was the first to see its possibilities. Instead of imitating the black lines of copper engravings, he used the white line which is the natural resultant of the process. During the nineteenth century W. sank to the level of a reproductive craft, although used with consummate skill by such men as the Dalziel brothers and Swan to facsimile the works of Leighton, Millais, Keene, Tenniel, and other artists of the time. Eventually photography and the introduction of process-engraving brought about its decline.

Early in the present century a number of artists saw in W. a medium of direct expression, and in 1920 they combined to form the Society of Wood Engravers. Since then the medium has flourished as an art, and is considered by many to be *par excellence* the best for book illustration. Wood blocks are prepared 'type-high' so that when engraved they can be locked in a printing machine and printed at the same time as the type, thus producing a decorated book and not a book with

plates. See D. P. Bliss, *A History of Wood Engraving*, 1928; R. J. Beedham, *Wood Engraving*, 1936, 1947; and I. Maonab, *Wood Engraving*, 1948.

**Woodford**, dist. of Essex, England, on the outskirts of Epping Forest. See WANSTEAD and WOODFORD.

**Wood Green**, bor. of Greater London, in Middlesex, England. The Alexandra Park and Palace are close by. Pop. 43,700.

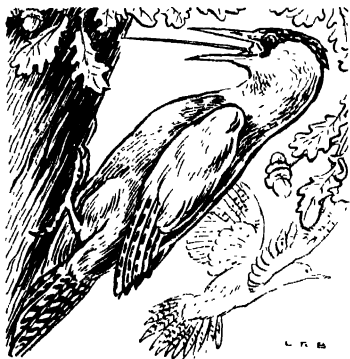
**Woodhall Spa**, urb. dist. of Lincolnshire, England, 6 m. from Horncastle. It is noted for its mineral springs. Pop. 1800.

**Woodhenge**, see under STONEHENGE.

**Wood-ibis**, see TANTALUS.

**Wood-lice**, name given to Isopod crustaceans of the family Oniscidae. Though they have all become adapted to terrestrial life, they find damp necessary to their existence, and some species, notably *Ligia oceanica*, which is over 1 in. long, are confined to the seashore. The food of W. is entirely vegetarian, and they are mainly nocturnal in their habits. The oval body consists of a small head, seven-segmented thorax, each segment bearing a pair of legs, and abdomen, the appendages of which are the respiratory organs. *Oniscus aspidella* does damage in gardens.

**Wood Naphtha**, see PYROXYLIC.



WOODPECKER

**Woodpeckers (Picidae)**, family of Scansorial birds. The Picidae have natural attributes for climbing up the bark of trees, and for obtaining from the crevices thereof the insects which constitute their food. The feet, though very short, are unusually strong; the nails are broad and crooked, and the toes placed in pairs, that is, two forward and two backward. As an additional and powerful support in their ascent of the trunks of trees, their tail feathers terminate in points, and are uncommonly hard, so that when they are pressed against the bark they assist the birds in their progress or in keeping their position. Ws. have a long and extensile tongue, capable of extension, and of enor-

mous length, which is furnished with muscles enabling the bird to dart it forth and to retract it again in a most remarkable manner. The Brit. species of W. are the spotted W. (*Dendrocopos major*), the Barred W. (*D. minor*), and the Green W. (*Cecinus viridis*).

**Wood Pigeon**, see CUSHAT.

**Woodruff** (*Asperula*), genus of small plants (family Rubiaceae). The sweet W. (*A. odorata*) is a common perennial in woods and is often gathered and dried for its persistent odour of new-mown hay.

**Wood-screws**, see under SCREWS, BOLTS, AND NUTS.

**Woods, Lake of the**, large irregular lake in the S.W. of Ontario, Canada, touching Manitoba on the W. and Minnesota, U.S.A., on the S. Its length is 70 m., breadth 10 to 50 m., and area 1500 sq m. It is fed by the Rainy R. and discharges through the Winnipeg R. into Lake Winnipeg.

**Wood-spirit**, see PYROXYLIC.

**Woodstock**: 1. Mun. bor. and mkt. tn. of Oxfordshire, England, on the Glyme. W. was the residence of some of the Eng. kings, and was the scene of the romantic legend of Henry II. and Fair Rosamund. After Blenheim (1704), the place was granted to the duke of Marlborough. Blenheim Palace being erected near by. Glove-making is carried on. Pop. 1800. 2. Co. tn. of Oxford, Ontario, 80 m. S.W. of Toronto, 25 m. E. of London and 32 m. from Lake Erie. It is the co. tn. of a rich agric. dist., and has abundant cheap hydro-electric power. Industries include machine-shops, furniture, stock foods, farm tools, organs and pianos, planing mill, stoves, metal signs, concrete machinery, hardware, and truck or lorry trailers. Pop. 12,500.

**Wood Swallow**, or **Swallow Shrike**, a genus of insectivorous birds (*Artamus*), indigenous to Australia, India, and Polynesia. They have a long, slightly-curved, and sharply-pointed bill, long wings, and short tail. General colour, black, blue, and rufous above, and white beneath. They are swift in flight and catch insects on the wing.

**Wood Tin**, variety of cassiterite (q.v.).

**Woodville**, or **Wydvile**, Elizabeth, see under EDWARD IV.

**Woodwork**, see CARPENTRY; CARVING; FURNITURE; INLAYING; JOINERY; MARQUETRY; POKER-DRAWINGS.

**Woodworm**, see TEREDO.

**Wookeny**, vil. of Somerset, England, in the Mendip Hills, close to Wells. Pop. 700.

**Wookeny Hole**, vil. of Somerset, England, situated near Wookeny. It is noted for its cave, also called Wookeny Hole, 500 ft. long in which the R. Axe has its source. Palaeolithic remains and traces of Romano-Brit. occupation have been found in it. Pop. of vil. 700.

**Wool**, soft, curly form of hair worn by some animals, useful to them in preventing loss of body heat, and adapted by man to the manuf. of textiles for clothing. From the biological point of view a distinction can be drawn between W. and hair: W. fibres are solid, i.e. have no

internal spaces, whereas hair fibres have a hollow core running up the centre of the fibre. The coats of the merino and Eng. breeds of sheep are known *par excellence* as W., while the term is also applied to the fibres obtained from llama, the alpaca, the Angora goat, and, perhaps, more debatably, to cashmere, camel, and Angora rabbit hair. The W. of the Angora goat, however, is more generally known as mohair. Microscopically, W. is distinguished more by the possession of a scaly surface to the fibre. The scales overlap the fibre surface overlap one another like tiles on a roof, thus producing the saw-like outline only perceptible under the microscope. The serrations are more numerous in the finest Ws., and it is to the existence of these minute irregularities that W. owes its property of matting or felt into a compact mass. This gives W. its unique value in the production of tweed-type fabrics and felts.

Chemically W. consists of a substance called keratin which belongs to the class of chemical substances called proteins and contains carbon, hydrogen, nitrogen, oxygen, and sulphur. It burns slowly, giving off an odour like burning feathers and leaves a small bead-like residue. This latter property serves to distinguish it from vegetable fibres which burn rapidly and leave only a little fine white ash. The properties desired in W. for manufacturing purposes are fineness of fibres, length of staple (a lock of fibres), strength and uniformity of fibre, elasticity, lustre, and freedom from woody seeds (burrs), and other vegetable matter. The weaving of woollen fibres appears to have been practised at a very early date. Herodotus mentions that the Babylonians were clothed in woollen tunics, and the Hellenic peoples were well versed in the art of weaving. The Romans understood all the essentials of the W. manufacturers' craft, and they carried their knowledge into the countries conquered and settled by them. Through the Middle Ages the chief centres of the woollen manuf. were on the continent, notably in Flanders. Forts were made at various times to estab. the industry securely in Britain (see under BRADFORD). Flemish weavers were introduced into Carlisle under royal protection in the reign of William I., and a colony was afterwards founded in Pembrokehire. Notwithstanding this encouragement, a great proportion of the W. grown in England was exported to Flanders, and Edward III. prohibited this export with a view to stimulating home industries. The prohibition was removed by Queen Elizabeth, but again from 1660 to 1825 the export of W. was forbidden. The constant encouragement given to woollen manufacturers led to large areas being turned into pasture land for the provision of the raw material. The development of machinery had the effect of concentrating the greater part of the industry on the N. coal-fields, and the S. centres gradually dwindled or persisted as seats for the manuf. of certain specialised products. In later years the supply of the raw material from Britain and

Europe has been almost negligible, the chief importations being from Australia, New Zealand, and S. Africa. In America the woollen manuf. was not estab. on factory lines until the end of the eighteenth century. The breed of sheep recognised as providing the best W. for fine quality clothing purposes is the merino. Originally a Sp. sheep, it has made its way into all quarters of the world. They were introduced into Australia at the end of the eighteenth century, and the colonists set about growing W. to supply the European market. (See also SHEEP.)

The terms woollen and worsted are used to describe the two kinds of yarn which can be spun from W., and the cloths woven from these yarns. In the woollen trade not only are short fibres employed, but all kinds of re-manufactured materials and by-products are used. These comprise nill, the short fibres rejected in the combing operation for worsted yarn production; mungo, the shreds of previously manufactured clothing; shoddy, the shreds of softer materials, as blankets, shawls, etc.; flecks, collections of fibre from the machines used in the various processes. Sheep's W. is sometimes washed before shearing; the process rids the fleece of extraneous dirt, but it also removes much of the natural grease. In shearing, the fleece should be clipped off in one continuous piece, the W. being rolled up and secured by a simple knot tied in a wool band put round the fleece. The fleeces are then classified according to general quality, usually on the farm or sheep station. After selling to the W. merchant or manufacturer it is sorted by the sorter or stapler, who divides each fleece into separate qualities, as the W. varies in quality from the shoulders to the tail of the animal. The operation of sorting requires discrimination and long training. In Britain a wool sorter is apprenticed for seven years before being considered proficient. The W. (except in yarn production) is then 'scoured' in a bath containing a mild alkali and afterwards dried by steam heat. The next operation is to disentangle the matted fibres of the fleece. To effect this the W. is fed into a 'wiley' consisting of a large drum and three small cylinders armed with spikes, in such a manner that the entangled fibres are pulled apart as they pass between the cylinders. W. is then usually 'blended,' i.e. Ws. of different kinds and W. substitutes, in proportions suitable for the purpose in view, are spread in layers forming a stack, each layer being oiled as it is put down. 'Scribbling' or 'carding' is an operation by which the mass of fibres is more perfectly mixed and rendered suitable for spinning. The carder consists of a number of cylinders with an enormous number of teeth which work the W. into a 'sliver,' a continuous film of fibres. In the final section of the carder this film is divided into narrow strips and then subjected to a reciprocating rubbing action so as to give a circular section. The sliver is now a long rod of pith-like W. with no twist, and therefore

capable of being stretched to a considerable extent. The attenuation and twisting required to convert sliver into yarn (*q.v.*) of the requisite count are performed by means of the 'spinning-mule,' a machine of somewhat complicated construction, though the operation is simple. For the preparation of worsted yarns some sixteen processes are required. Among these is an operation known as 'combing.' This is performed by a machine which separates from the mass all the fibres above a certain length and imparts a high degree of parallelism to them. After spinning, therefore, worsted yarn presents a clearer-cut appearance than woollen yarn, which remains fluffy. The principles of weaving are similar to those employed in other textiles. Dyeing may be performed at almost any stage of the process, given the necessary cleansing preliminaries. Some finishing operations vary according to the nature of the fabric. Some woollen cloths are known as tweeds, meltons, doerings, buckskins, etc., and are characterised by softness and fullness. Worsted forms the largest class of suit and dress materials. See the *American Wool Hand Book*, E. Lipson, *History of the English Woollen and Worsted Industries*, 1921; J. W. Radcliffe, *Manufacture of Woollen and Worsted Yarns*, 1925; and C. L. Bird, *Theory and Practice of Wool Dyeing*.

**Woold**, see **WELD**.

**Woolf (Adeline)**, Virginia (1882-1911). Eng. novelist, *b.* in London. She was educated at home, and married in 1912 Leonard Sidney Woolf and at Hogarth House, she and her husband set up the Hogarth Press. Her first novel, *The Voyage Out*, appeared in 1915, but it had in fact been written some years previously, as is evident from its immaturity. In 1919 she pub *Night and Day*, but did not achieve a really characteristic work until the production of *Jacob's Room* (1922), which reveals her qualities of subtle apprehensions and delicate balance of taste. Her early works had been realistic studies; but in this she followed Joyce in adopting the 'stream of consciousness' method. Later books which won an international reputation were *Mrs. Dalloway* (1925), *To the Lighthouse* (1927), *Orlando* (1929), *The Waves* (1931), and *The Common Reader* (1925), the last being a collection of articles for the *Times Literary Supplement*. *Orlando* is perhaps her most outstanding novel; a biography of Roger Fry was pub. in 1940; in 1911 appeared *Between the Acts*, a novel pub. posthumously, and, in 1912, *The Death of the Moth*, which contains a selection from a mass of miscellaneous work left by her at her death. The beauty and sensitivity of her prose, especially in *The Waves* is unequalled among modern Eng. novelists. See lives by E. M. Forster, 1912; J. Bennett, 1915; R. L. Chambers, 1948; B. Blackstone, 1948; also Lord David Cecil, *Poets and Story-Tellers*, 1949.

**Woolhampton**, vil. of Berkshire, England. Since 1903 the Rom. Catholic Abbey and public school of Douai have been situated at W. This foundation had

existed in Paris from 1615 to 1793 for Eng. Catholics as the Benedictine Abbey and School of Our Lady and St. Edmund, King and Martyr. In 1818 it was revived at Douai, and flourished there until expelled from France under the Associations Law. There are about 170 pupils, aged between 13½ and 18½. The foundation of 1615 was intended to continue the work of the Abbey of Bury St. Edmunds, dissolved at the Reformation.

Douai should not be confused with Downside Abbey and public school. This school for Eng. Catholics was founded at Douai about 1603 and was attached to the Eng. Benedictine community of St. Gregory. It moved to Acton Burnell, England, at the Fr. Revolution, and settled at Downside, near Bath, in 1814. There are over 400 pupils.

**Woolcott, Alexander (Humphrey)** (1887-1943). Amer. journalist and author, *b.* at Phalanx, New Jersey. He was educated at Hamilton College, and became, in 1909, dramatic critic for the New York *Times*, later for the New York *Herald*, and New York *World*. From 1929 to 1913 he was a popular radio broadcaster. He cultivated a flamboyant literary personality, and his books are written in an ornate style about his whimsical fancies.

**Woolloons**, see under **WOOL**.

**Woolley, Sir Charles Leonard** (*b.* 1880). Brit. archaeologist, *b.* in London and educated at St. John's, Leatherhead, and New College, Oxford. He was assistant-keeper at the Ashmolean Museum, Oxford, from 1905 to 1907, and made excavations at Corbridge, 1906-07. W. excavated in Nubia for the Eekley B. Cox, Jun. Expedition 1907-11 and was a member of the Oxford Univ. Expedition to Nubia, 1912. He conducted the Brit. Museum excavations at Caracemish 1912-14 and did archaeological work in Sinai for the Palestine Exploration Fund, 1914. W. conducted further excavations at Caracemish, 1919; at Tel al Amarna for the Egypt Exploration Society, 1921-22; at Ur, 1922-34; near Antioch, Syria, 1936-38; and in Hatay before and after the Second World War. W. was knighted in 1935. His work at Ur is of great historical importance. His works include: *Excavations at Ur of the Chaldees* (1923) (and six books in continuation of the subject, 1925-30); *Excavations at Tel el Obeid* (1925); *The Sumerians* (1929); *Ur of the Chaldees* (1930); *The Protection of the Treasures of Art and History in War Areas* (1917).

**Woolley, Frank Edward** (*b.* 1887). Eng. professional cricketer, *b.* at Tonbridge. From 1906 he played for Kent as a left-handed batsman and bowler. In 1908 at Lords he took 6 wickets for 8 runs within 5 overs, and in 1911 r. Surrey he took 7 wickets for 9 runs. With Fielder in 1909 he made 235 for the tenth wicket in the match Kent r. Worcestershire. In 1928 he scored 3352 runs. W. played in Test Matches in S. Africa and in Australia, and during his career scored 58,969 runs (average 40.75), took 2068 wickets (average 19.86), and scored 145 centuries.

**Woolsorter's Disease**, see ANTHRAX.

**Woolton of Liverpool**, **Frederick James Marquis**, first Baron (b. 1883). Brit. business man and politician, b. in Manchester and educated at Manchester Grammar School and Univ., where he was for a time a research fellow in economics. He entered business, and became chairman and senior managing director of Lewis's Ltd., Lewis's Investment Trust Ltd., and its subsidiary companies. He was elected chancellor of Manchester Univ. in 1944. He served on sev. gov. committees and became director-general of equipment and stores in the Ministry of Supply from 1939 to 1940; and was minister of food from 1940 to 1943, minister of reconstruction from 1943 to 1945, and lord president of the council in the Churchill caretaker gov. in 1945. After the general election in 1945 W. was appointed chairman of the Conservative party and worked vigorously to strengthen the party organisation. He was knighted in 1955 and created a peer in 1959.

**Woolwich**, metropolitan bor. of London, formerly a separate tn. of Kent, partly also in Essex (N. Woolwich), on the Thames. The metropolitan bor. was formed by the amalgamation of the pars. of Woolwich, Plumstead, and Eltham, and is the second largest bor. in London (8282 ac.). Eleven per cent of its area is devoted to public open spaces. N. Woolwich is served by a foot tunnel and the Woolwich Free Ferry from Woolwich proper. The dockyard was an important shipbuilding centre from early Tudor times until it was closed in 1869. The famous Royal Arsenal developed from the Royal Laboratory, Carriage Dept., and a Powder House which were probably estab. about the same time as the dockyard. The main gov. foundry was transferred to Woolwich from Moorfields under the direction of Andrew Schachal about 1716. The Royal Military Academy estab. inside the Arsenal in 1741 was the first military school in the kingdom. It was amalgamated with Sandhurst Military College in 1946. Other important buildings are the Artillery Barracks (1775), Royal Military Repository, and the Rotunda. Interesting Tudor buildings which remain are the Great Hall of Eltham Palace, once a royal residence, which possesses a superb chestnut hammerbeam roof, and the Tudor Barn at Well Hall. The latter building was part of Well Hall Manor, once the home of Margaret Roper, daughter of Thomas More. Two members are returned to Parliament. Pop. (estimated) 149,200.

**Woolworth Family**, family of Amer. merchants and businessmen. Frank Winfield W. (1852-1919), b. at Rodman, New York, and educated at New York Business College, used his capital to open a 'five-cent' store in Utica, New York, in Feb. 1879: this was not a great success, but, starting again in Lancaster, Pennsylvania, in June 1879, and helped by his brother, Charles Sumner Woolworth (1856-1947) W. made his business pay. When F. W. Woolworth died, he con-

trolled about 1000 'five-and-ten cent' stores in the U.S.A. and Canada, and 75 similar concerns in Great Britain. He left a fortune of £9,000,000. C. S. Woolworth succeeded his brother as chairman of the F. W. Woolworth Company, which had been incorporated in 1912, and at his death the W. fortune descended to his grand-daughter, Barbara Hutton.

The basic idea of the W. store was to sell nothing at a cost greater than five or ten cents (3d. to 6d. in England); to keep no books, and hence to sell for cash only; to make no deliveries, and hence further to cut the overhead cost; and, finally, as F.W.W. opened more shops, to buy things in large quantities from factories, getting the advantage of low prices and a large discount for cash payment. The W. headquarters is the W. building in New York, for many years the tallest sky-scraper in the city. The fixed price was abandoned during the Second World War owing to economic conditions. Before the Second World War the concern had spread to Germany: in Sept. 1950 there were 1782 stores in the U.S.A., 148 in Canada, 8 in Cuba, 44 in Germany, and over 750 in Great Britain.

**Woomera**, see under ROCKETS.

**Woonsocket**, city of Providence co., Rhode Is. (N.), U.S.A., on Blackstone R., about 15 m. from Providence. It is the centre of a group of manufacturing villages. Pop. 49,300.

**Woorali**, name for curare (q.v.).

**Worcester**. 1. City, mtrk. tn., co. and parl bor., and co. tn. of Worcestershire, England, 22 m. S.W. of Birmingham. It is situated upon both banks of the Severn, though principally on the l. b. W. was important as early as the seventh century owing to its situation on a ford in the Severn. The city motto, 'Faithful in war,' commemorates the royalist support given by W. during the Civil Wars. In 1651, Charles II. lodged in the city and from the cathedral tower watched his forces routed by Cromwell's troops. Many royalist soldiers were imprisoned in the cathedral after the battle. W. has been an episcopal see since 680 but its early hist. is obscure. In 964 St. Oswald founded a new church there for Benedictine monks, and Bishop Wulfstan began rebuilding on a large scale in 1084. King John is buried between the shrines of Oswald and Wulfstan.

The cathedral of Christ and St. Mary the Virgin includes a Norman crypt, an impressive Geometrical W. window, and a Perpendicular cloister with a well-preserved lavatorium and some carved bosses on the lierne vaulted roof. The circular Norman chapter house and the original refectory, now used by the King's School, remain. The external length of the cathedral is 415 ft., and the central tower (completed 1364) is 195 ft. high. The exterior was extensively restored between 1857 and 1874. The building of the Early Eng. choir and lady chapel began in 1224 and was effected by Bishops De Blois and Cantelupe, whose effigies are in the chapel. The last important addition to the cathedral was Prince

Arthur's chantry, with a magnificent Perpendicular screen, erected by Henry III. in memory of his eldest son.

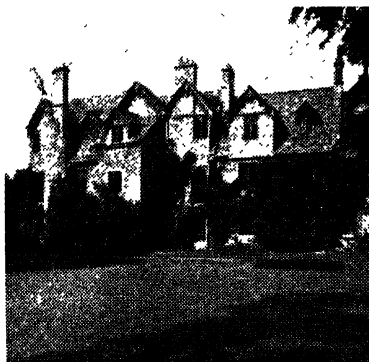
Another interesting building is the Commandery, formerly called the Hospital of St. Wulfstan (1085-1541). It was founded by Wulfstan for a master, priests, and brethren, under the Rule of St. Augustine. St. Helen's is the oldest church in W., dating back to 680 but rebuilt in the thirteenth and fifteenth centuries. St. Andrew's and St. Albas's are other medieval eccles. structures, but these three churches are not now used as places of worship. Medieval buildings still remain in New Street and Friar Street, the most important being that built about 1480 by the Grey Friars. In 'King Charles's House' Charles II. is said to have hidden after his defeat at W. From 'Queen Elizabeth's House' in The Trinity Queen Elizabeth, according to tradition, addressed the people when she visited W. in 1574. W. is rich in Georgian buildings. The Guildhall (1724-23) is the work of Thomas White, a native of W. The Royal Grammar School dates back to the thirteenth century, when it was supported by merchants of the Trinity Guild. Elizabeth granted it a charter in 1561. The W. cathedral King's School was estab. and endowed out of the monastic funds by Henry VIII. in 1541 and reorganised in 1881. More modern buildings include the Co. Hall, the W. Royal Infirmary, and the Victoria Institute.

From medieval times W. was the centre of a prosperous glove trade. The firm of Dent's and Fownes, founded in the eighteenth century, carry on this tradition. The Royal W. Porcelain Works were founded in 1751 by 'John Wall doctor of Physic and William Davis Apothecary.' Wall was also connected with W. Royal Infirmary, which opened in a house in Silver Street in 1745. Engineering is the leading modern industry in W., and includes mining and electrical engineering. There are also iron and brass foundries, pattern shops and machine and fitting shops. Other industries include the manuf. of W. sauce, printing, footwear, furniture, and agric. machinery. Pop. 60,800. See T. R. Nash, *Collections for the History of Worcestershire*, 1781-99; E. F. Strange, *The Cathedral Church of Worcester*, 1900; and J. M. Wilson, *Worcester Cathedral* (in the Official Guide to Worcester, 1948). 2. City and co. seat of Worcester co. Massachusetts, U.S.A., 44 m. from Boston. The Blackstone, Chicopee, and other rivs. afford a plentiful water supply. There are fine public buildings and parks, loom and envelope manufs., foundries, wire works, wool and silk mills, and manufs. of leather goods, shoes, and carpets. W. was known as 'Quinsigamond' till 1684. Pop. 195,300.

**Worcester, Florence of**, see FLORENCE OF WORCESTER

**Worcester College**, college of Oxford Univ. at the junction of Walton Street, Worcester Street, and Beaumont Street. It was founded as W. College in 1714.

by Sir Thomas Cookes, a Worcestershire baronet, who had previously refounded Bromsgrove School in 1693. The site was partly occupied as early as 1223 by Gloucester Hall (founded for Benedictine monks), which was dissolved at the Reformation. Many of the monastic buildings remain, and are used as undergraduates' rooms. The head of the college is the Provost.



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#### WORCESTER COLLEGE

The medieval buildings were part of the original monastic foundation.

**Worcester Journal**, see BERROW'S WORCESTER JOURNAL.

**Worcestershire**, midland co. of England, bounded N. by Staffordshire, S. by Gloucestershire, E. by Warwickshire, and W. by Herefordshire and Shropshire. The surface varies, the S. and S.W. being hilly, while through the centre run the riv. valleys, with the Lacey and Clent hills in the N. The prim. range is that of the Malvern Hills in the S.W., which reaches a height of 1395 ft. in Worcester Beacon. The N. Cotswold Hills and Breton Hill lie along the S.E. border of the shire. The Severn is the chief riv., with its tribs. the Teme, Stour, and Avon, forming the vales of Worcester (Severn), Teme and Evesham (Avon), the most fertile part of the co. It is well wooded and contains the two anct. forests of Wyre and Malvern Chase. The co. is famous for its orchards and market gardens; and hops are also grown; almost the whole co. is under cultivation, rather more than half being devoted to permanent pasture; wheat and oats are the main crops. Coal is mined and ironstone, limestone, and salt are also found. Droitwich and Stoko Prior are noted for their brine springs, and Malvern is a holiday and health resort, notable also for its ann. drama festival. Worcester (q.v.) is famous for the manuf. of porcelain and engineering, and Kidderminster for carpets; while in the N. are a group of tns., Dudley, Netherton, etc., included in the

Black Country, where iron-work, etc., is carried on. Other manufs. are needles and fishing tackle at Redditch; glass at Stourbridge, and gloves at Worcester. Canals connect the Severn with the Midland canal system. Worcester is the co. tn., other important tns. being Bewdley, Droitwich, Dudley, Evesham, Kidderminster, Stourport, Stourbridge, and N. of the co., Kings Norton and Halesowen on the Birmingham fringe. The co. contains three co. and three bor. constituencies. The greater part of the co. was at one time in the hands of the church, and there were no less than thirteen great monastic foundations. Of these there are the ruins at Pershore and Evesham, both dating from the eighth century, Worcester Cathedral, and the priory church at Malvern also of the same date; and ruins at Halesowen, Bordesley, and Asley dating from the thirteenth century. Notable figures in literature and music associated with W. include the chronicler Florence of Worcester, Samuel Butler (author of *Hudibras*), Richard Baxter, Sir Edward Elgar, and Francis Brett Young. The area is 700 sq. m. Pop. (1939) 477,700. See Victoria County History, *Worcester*; F. T. S. Houghton, *Worcestershire*, 1922; A. Mawer and F. M. Stenton, *Place Names of Worcestershire*, 1927; A. Moe, *Worcestershire*, 1918; and L. T. C. Rolt, *Worcestershire*, 1949.

**Worcestershire Regiment**, Brit. regiment, formerly 29th and 36th Foot. The 29th was raised in 1694, and served under Marlborough and took part in the Amer. War, 1776-77. A detachment served in Lord Howe's fleet on 'the Glorious First of June', 1794: it was granted the Naval Crown as a badge. The 29th served under Wellington in the Peninsula with great distinction, and took part in sev. Indian campaigns. The 36th was raised in 1701 and was organised for 'sea-service.' It served in Spain, Nova Scotia, Flanders, before going to India in 1783. The regiments were linked in 1881 and took part in the S. African War, 1899-1902. During the First World War they raised twenty-two battalions, and served in France, Flanders, Italy, Macedonia, Gallipoli, Egypt, Mesopotamia, and Persia. The second battalion of the regiment gained great distinction for saving the Channel ports from capture by Gers. at Gheluvelt, Oct. 31, 1914. In the Second World War the regiment fought in France, Eritrea, N. Africa, Burma, Italy, and N. W. Europe, and in the Far East. As a unit of the Second Army it took a prominent part in the Rhine operations of March, 1945.

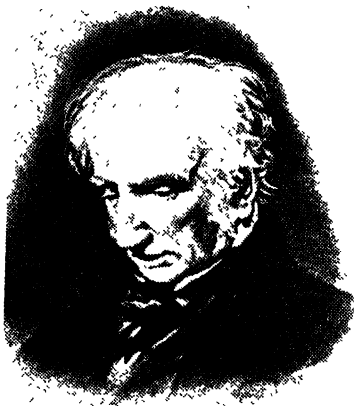
**Worde, Wynkyn (or Winkin) de, or Jan van Wynkyn** (d. c. 1534), Eng. printer, who came to England from Alsace-Lorraine, and helped Caxton from 1477, succeeding him at his printing office (1491). He became naturalised in 1496, and lived in Fleet Street, London, from 1502, removing to St. Paul's Churchyard in 1509. He made improvements in the art of printing, especially in type-cutting, his works (over 600 in number) being distinguished by elegance and neatness.

See E. G. Duff, *Printers, Stationers, and Bookbinders of Westminster and London, 1476-1535*, 1906.

**Wordsworth, Dorothy** (1771-1855), Eng. writer, only sister of the poet, b. at Cockermouth, Cumberland. From 1795 she kept house for her brother, accompanying him and Coleridge to Germany (1798-99). She later settled with Wordsworth and his wife at Grasmere, whence they moved to Rydal Mount (1813). The poet acknowledged how much he owed to her inspiring companionship, and dedicated to her the *Evening Walk* (1793). Her own writings display great powers of description, and a keen appreciation of natural beauty. See lives by E. Lee, 1886; and E. de Selincourt, 1933. See also C. M. McLean, *Dorothy and William Wordsworth*, 1927.

**Wordsworth, William** (1770-1850), Eng. poet, the son of a land attorney, b. at Cockermouth, Cumberland, educated at Hawkshead grammar school, and St. John's College, Cambridge. In the summer vacation of 1790 he made a walking tour through France and Switzerland, and in Nov. 1791, returned to France to study, spending sev. months in Orleans and Blois. It was during this time that he had a love affair with Annette Vallon, and by her had the daughter who is probably addressed in the sonnet beginning 'It is a beauteous evening, calm and free.' This romantic episode coloured much of his early writing, and some modern critics have traced the origin of his poetic genius to it. He had now become an enthusiastic supporter of the Fr. revolution. The collapse of his early faith in the revolutionary ideals was followed by a period of great mental depression but he was won back by the influence of his sister Dorothy. Returning to England he pub., in 1793, the *Evening Walk*, on the landscape round Ambleside and Hawkshead, and the *Descriptive Sketches*, the materials of which were supplied by continental acquaintances. These two poems are in the classic couplet and in the poetic style then in vogue, but the copious detail in description takes them out of the ordinary category of eighteenth-century landscape poetry. Two years later, having inherited a legacy of £900, he went to live at Alfoxden in Somerset, where he made the acquaintance of Coleridge. The two poets became firm friends, and through Coleridge W. became acquainted with Charles Lamb and Hazlitt. In 1798 he pub. with Coleridge a joint vol. of verse styled *Lyrical Ballads*, which, although of immense importance in Eng. literature, attracted little favourable attention at the time. W.'s *Preface* to the *Lyrical Ballads* embodies his theory of poetry as 'emotion recollected in tranquillity.' His ode, *Intimations of Immortality from Recollections of Early Childhood*, which was pub. in 1803, concisely epitomises W.'s philosophy. In the same year W., with his sister Dorothy and Coleridge, went to Goslar in Germany. They returned to England the next year and settled at Grasmere, which was W.'s

home till 1813, when he removed to Rydal Mount. He had married Mary Hutchinson in 1802, and thereafter for many years continued to write and pub. poetry. In 1813 W. was given the sinecure of distributor for the co. of Westmorland, which he held until 1842, when, on his retirement, he was granted a Civil List pension. In 1843 he accepted the poet-laureateship in succession to Southey. *The Prelude, or Growth of a Poet's Mind*, was issued posthumously in 1850. In this long poem W. traces meticulously his own intellectual growth from childhood to early manhood, and expatiates on the evolution of his book of Nature and the influence of the Fr. Revolution on his way of thinking.



WILLIAM WORDSWORTH

W. is principally distinguished for his love of nature, and for the simplicity of his style. His dread of appearing artificial sometimes led him, however, into excesses. At his best he had a magnificent gift of language, and the music of his verse is inspiring. But as he grew older, he became increasingly conventional in temperament; he was unyielding and lacking in humour, and obviously conscious of his talents and mission as a poet. His greatest poetry, notably the sonnets, was mostly written before 1815: already in his *Immortality Ode* he had anticipated a falling-off in his poetic skill. The work of his last years generally lacks inspiration or originality.

There are eds. of *Poetical Works* by W. Knight (with memoir), 11 vols., 1882-89; E. Dowden (with memoir), 7 vols., 1892-93; N. C. Smith, 3 vols., 1908; E. de Selincourt and Helen Darbishire, 5 vols., 1940-49; and E. de Selincourt ed. *The Prelude*, 1926; and A. B. Grosart ed. *The Prose Works*, 3 vols., 1876. See lives and studies by F. W. H. Myers, 1881;

W. A. Knight, 1889; E. Legouis, 1896 (Eng. trans. 1897); W. Raleigh, 1903; G. M. Harper, 1916; H. W. Garrod, 1927; C. H. Herford, 1930; H. Read, 1930, 1949; E. de Selincourt, *The Early Wordsworth*, 1936; Frederika Beatty, *William Wordsworth of Rydal Mount*, 1939; J. C. Smith, *A Study of Wordsworth*, 1944; and N. Lacey, *Wordsworth's View of Nature*, 1948. See also B. Willey, *Eighteenth Century Background*, 1940; and D. G. James, *The Romantic Comedy*, 1948.

**Work**, in mechanics and engineering, is the effect produced in any mass by a force acting against inertia or resistance. The effect may result in strain merely or produce motion of the mass; in all actual cases the whole W. possible is distributed, only a portion of it becoming *useful*, a great deal being expended in overcoming friction, or as, in the case of steam and electricity, 'leaking' owing to the impossibility of controlling the direction of the force. In mechanical W. a foot-pound is the unit. Thus if a body of 2 lb. weight changes its level by 5 ft., the W. given out in falling, or received on rising, is 10 foot-pounds, neglecting friction, etc. The W. is measured as the product of resistance and the distance over which it is overcome. This is so whether the motion is direct, inclined, or curved. If in the case of a force of  $p$  lb. exerting a pull, the pull be not direct but inclined at an angle of  $\theta$  to the resultant motion, the effective force is  $p \cos \theta$ . *Power* takes account of time; it is the time rate of doing W. One horse-power is the W. of 33,000 foot-pounds done in one min. *Energy* is the capability of doing W. The metric unit of W. is the kilogram-metre; in the C.G.S. system, the unit is the dyne-centimetre or 1 *erg*. One joule (q.v.) = 10,000,000 ergs = 0.7373 foot-pounds; 1 foot-pound = 13,563,000 ergs. *Resilience* is the W. done on a bar in producing stress, or the W. the bar will do in regaining shape when relieved from stress.

**Workers' Educational Association**, see under ADULT EDUCATION; TRADE UNIONS, *Educational Activities*; also MANSBRIDGE, ALBERT.

**Workhouse**, see under POOR LAWS.

**Workington**, mun. bor., seaport and mkt. tn. of Cumberland, England, 34 m. from Carlisle, on the Derwent. Its industries include coal mining, iron and steel manuf., heavy and light engineering, and shipbuilding. Pop. (estimated 1948) 28,500.

**Workmen's Compensation**, system in force in England until 1946, whereby compensation was paid to persons injured at work, or, if they were killed, to their dependants. The principle underlying the Workmen's Compensation Acts (all of which are now superseded by the National Insurance (Industrial Injuries) Act, 1946) was that of the provision of weekly compensation in cases of injury at work without proof of negligence. Employers were not compelled to insure, except owners of collieries as from 1935 when the W. C. Coal Mines Act came into



force. The principle of W. C. was introduced into English law by the Workmen's Compensation Act of 1897, prior to which Act the remedies available to the injured workman were either an action at common law or an action under the Employers' Liability Act, 1880. The Act applied to Scotland.

#### WORKMEN'S COMPENSATION ACT, 1897.

This marked a great advance in the social obligations of masters and employers, and made them in effect insurers of employees against accidents. Proof of negligence was no longer required. The Act provided that a workman might recover compensation for personal injury caused by an accident 'arising out of and in the course of employment.' But it restricted the right to get compensation for injuries sustained in one or other of a list of notoriously dangerous occupations, and a further defect was that it did not apply to injuries to health caused by employment in noxious industries.

#### WORKMEN'S COMPENSATION ACTS, 1900 TO 1923.

The Act of 1900 extended the scope of the Act of 1897 to employment in agriculture, but all the earlier Workmen's Compensation Acts were repealed by the Act of 1906, which re-enacted their principles while omitting most of the above-mentioned limitations and exceptions. It gave the right to obtain compensation to *all* persons in regular employment (except soldiers, sailors, and policemen) whose remuneration was not over £2.0 a year. It also introduced the principle of including under the notion of 'accident' certain industrial diseases. The only defence left to the employer was where he could prove that the accident was due to the 'serious and wilful misconduct of the workman'—words which have given rise to a great number of decisions which are sometimes difficult to reconcile with each other. This defence did not apply in cases of death or serious and permanent disablements. The Act of 1923 considerably amplified the definition of 'workman' given in the Act of 1906 by including certain accidents happening when the workman was acting *contrary to regulations*.

#### THE WORKMEN'S COMPENSATION ACT, 1925.

This Act consolidated the law and applied to all cases where the accident happened on or after Jan. 1, 1924. It repealed all the previous W. C. Acts, except a few sections of the Act of 1923. There were subsequent amendments.

The W. C. Act of 1925 gave the right to compensation for injury by accident 'arising out of and in the course of employment,' provided the injury disabled the workman for a period of at least three days from earning full wages and provided the injury was not attributable to the serious and wilful misconduct of the workman.

The compensation under the repealed Workmen's Compensation Acts was payable to or for the benefit of the workman, but, when death resulted from the injury,

to or for the benefit of his dependants. The expression 'workman' included any person (subject to certain specific exceptions) who had entered into or works under a contract of service or apprenticeship with an employer, whether by way of manual labour, clerical work or otherwise; and also a person engaged in plying for hire any vehicle or vessel which he had obtained from the owner of the vehicle under a contract of bailment (but not under a hire-purchase agreement) in consideration of a fixed sum or a share of the earnings. Nevertheless the term excluded many other categories of persons. 'Employer' included any body of persons incorporated or unincorporated and the legal personal representatives of the employer; and also, where an employer lent the services of an employee temporarily to another employer, he none the less remained liable to pay compensation for an injury occurring to the workman during his temporary service.

As regards the application of the W. C. Acts to industrial diseases, compensation was only recoverable where the disease was one of those included in Schedule III (anthrax, lead, mercury, phosphorus, and arsenic poisoning, ankylostomiasis, etc.).

#### THE BEVERIDGE REPORT.

The Beveridge Report (1942) on social insurance recognised that the existing system of W. C. had conferred great benefits in the past. On the other hand the Report drew attention to many serious disadvantages. It referred to the contentious and costly method for settlement of disputes; the difficulties of the workman who was not assisted by a trade union or approved society in prosecuting a claim; the possibility of improper pressure on him to reduce his claim or to take up work for which he was not fit; the want of complete security for the payment of compensation; the difficulties of demarcation between industrial and non-industrial cases; the unsatisfactory provision made by lump sum settlements; the high costs of administration over parts of the field; the inappropriateness of the system in cases of industrial diseases which develop over a long period or are of a recurrent nature; and the absence of any provision for medical and post-medical rehabilitation of the injured workman.

#### NATIONAL INSURANCE (INDUSTRIAL INJURIES) ACT, 1946.

This Act, which repealed as from 5th July, 1948, all but a few sections of the previous W. C. Acts 1923-1945, gave legislative form to the basic principles set out in Cmd. 6551 (pub. Sept 1944) following the Beveridge Report for an industrial injury insurance scheme. It changed the whole basis of legislative provision against industrial injury by accident by substituting a system based on *loss of faculty* for a system based on *loss of earnings*. The Act substituted for the W. C. Acts a universal and compulsory system of insurance against personal injury caused by accident arising out of and in the course of a person's employment and against certain specified diseases and

catalogued injuries. An accident is deemed to arise 'out of and in the course of' an insured person's employment, notwithstanding that he is, at the time of the accident, acting in contravention of any statutory or other regulations applicable to his employment, or of any orders given by or on behalf of his employer, or that he is acting without instructions from his employer, if (a) the accident would have been deemed so to have arisen had the act not been done in contravention as aforesaid or without instructions from his employer; and (b) the act is done for the purposes of and in connection with the employer's trade or business. A disease or injury may be prescribed for the purposes of the Act in relation to any insured persons, if the minister of national insurance is satisfied that (a) it ought to be treated, having regard to its causes and incidence and any other relevant considerations, as a risk of their occupations and not as a risk common to all persons; and (b) it is such that, in the absence of special circumstances, the attribution of particular cases to the nature of the employment can be established or presumed with reasonable certainty. The Act covers virtually all persons employed under contract of service, and also some special employments, such as fishermen.

**Rates of Contributions and of Disablement Pensions.**—Under the Act the basic rate for injury benefit and complete disablement is 45s., with somewhat lower rates for those under 18. The weekly rates of contribution payable by insured persons and employers are: men over 18, 4d.; women over 18, 3d.; boys under 18, 2½d.; girls under 18, 2d.

**Injury Benefit.**—An injured person is entitled to injury benefit in respect of any day on which, as the result of the injury, he is incapable of work during the injury benefit period; but he will not be entitled to benefit in respect of the first 3 such days, unless he is incapable of work during the period on not less than 12 days. Injury benefit is defined as an allowance payable at the weekly rate of forty-five shillings; and the amount payable for any day of incapacity is one-sixth of the weekly rate (i.e. of 45s.); but if the beneficiary is under 18 and not entitled under the Act to an increase of benefit in respect of a child or adult dependant his (or her) weekly rate is 33s. 9d. while he is between the ages of 17 and 18 and 22s. 6d. while he is under 17.

**Disablement Benefit.**—An insured person is entitled to disablement benefit if, (a) at the end of the 'injury benefit period' he is suffering from loss of physical or mental faculty which either (i) is likely to be permanent; or (ii) is substantial, i.e. is such that the extent of the disablement is not less than 20 per cent (assessed in accordance with the statutory provisions); or (b) at some time after the end of the injury benefit period he becomes subject to a loss of physical or mental faculty which is substantial and likely to be permanent. Where the assessment is 20 per cent or more a

pension is payable proportionate to the degree of the disablement. The weekly rates of disablement pension range from 45s. per week to 9s. When the full extent of disablement is assessed for the period taken into account as amounting to less than 20 per cent, disablement benefit will be in the form of an industrial disablement gratuity, of an amount fixed according to the length of the period above mentioned and the degree of disablement, but not in any case exceeding £150.

**Increase of disablement benefit.**—Where the injured workman, as a result of the relevant accident, is unable to return to his regular occupation or to undertake work of an equivalent standard, disablement benefit may be increased by the payment of a special hardship allowance (maximum 20s. a week). There is also provision for increases of disablement benefit on account of permanent unemployability, hospital treatment, need for constant attendance, and, under certain circumstances, child and adult dependants.

**Death Benefits.**—The weekly rate of pension payable to the widow of the deceased (provided that she was living with her husband at the time of his death) will be at the rate of 30s. (a) for any period for which she is entitled to an allowance under the Act in respect of a child of the deceased's family; or (b) was over 50 years of age at the deceased's death or has reached 50 during a period for which she was entitled to such an allowance; or (c) where the widow at the deceased's death was permanently incapable of self-support; and in any other case the rate will be 20s. In the case of a widower the pension for life is 30s. weekly if he was being wholly or mainly maintained by his wife and was permanently incapable of self-support. A parent of the deceased is entitled to death benefit if at the deceased's death he was being to a substantial extent maintained by the deceased, or would, but for the relevant accident, have been so maintained. Provision is also made for children of the deceased's family, and also for dependant relatives of the deceased, and for women having the care of the deceased's children.

**DEFENCE OF 'COMMON EMPLOYMENT. —REPEAL OF EMPLOYERS' LIABILITY ACT.—DAMAGES FOR PERSONAL INJURY OR DEATH IN A COMMON LAW ACTION.**

The Law Reform (Personal Injuries) Act, which is related to the National Insurance (Industrial Injuries) Act, 1946 taken with the Contributory Negligence Act of 1945 and the Crown Proceedings Act, 1947, effected a long-needed rationalisation of the law relating to injuries and negligence—though the first-named Act, contrary to the recommendations of the Departmental Committee appointed after the publication of the Beveridge Report, is confined to injuries associated with employment instead of being applied, where appropriate, to injuries of every kind. When 'workmen's compensation' was superseded by a system of benefits

provided through compulsory insurance and payable regardless of anyone's 'negligence,' the question naturally arose whether the workman who also succeeds in recovering damages at common law should receive both insurance benefits and damages in full, or whether the latter should be reduced by the amount of his benefits. Those and cognate questions were referred to the Departmental Committee, whose recommendations are the basis of the Law Reform (Personal Injuries) Act. That Act abolishes the defence of common employment and repeals the Employers' Liability Act, 1880. The Act also provides that in an action for breach of statutory duty the employer shall not be liable to damages for personal injuries or death if it can be shown 'that it was not reasonably practicable to avoid or prevent the breach.' The third clause of the Act provides that in fatal cases and in those of prolonged or permanent injuries, only half the value of (insurance) benefits up to five years from the date of the injury shall be taken into account by the Court in assessing damages in an action for damages for personal injuries (including any such action arising out of a contract). The Act provides that the expression 'personal injury' includes any disease and any impairment of a person's physical or mental condition. The fifth and last clause provides that the Act shall bind the Crown (i.e. the gov.) as an employer. See Lord Halsbury, *Laws of England*, 1907-17, 1931; A. Wilson and H. Levy, *Workmen's Compensation*, 2 vols., 1939-41; and W. A. Willis, *The Workmen's Compensation Acts, 1925-1943, 1945*, with supplement, 1946.

**Works Councils**, see under INDUSTRIAL WELFARE.

**Workshops Acts**, see FACTORY LEGISLATION.

**Works, Ministry of**. Although the history of the dept. can be traced back through the early ages, it was not until after 1852 that it became known as H.M. Office of Works. Its prin. functions were the provision, furnishing, and maintenance of accommodation for civil depts. and of the headquarters of service depts.; care and maintenance of royal palaces, the Houses of Parliament, embassies and legations abroad, certain museums and art galleries; the preservation of ant. monuments and the management and maintenance of royal parks. In 1940, the dept. was given new and important responsibilities relating to the building and civil engineering industries and received the title of the Ministry of Works and Buildings, subsequently amended to Ministry of Works. In addition to the old Office of Works functions the ministry has responsibility for planning and programming the nation's building and civil engineering work and is concerned with the supply of building labour to the building, civil engineering, and building materials industries; the promotion of incentive and productivity schemes; the recruitment of building trade apprentices; control of building labour and material

by the use of licences; assisting the production and distribution of building materials; and promulgating the results of research to the industry.

**Worksoop**, mkt. tn. and bor. of Nottinghamshire, England, on the Rytton. Its par. church, which formerly belonged to an Augustinian priory, is a fine cruciform building. W. is a mining centre; has chemical, timber, glass, and malting works and an important cattle market. Pop. 32,000.

**Works Agency, Federal (U.S.A.)**, created by the President's reorganisation plan of 1939 and executive order 9357 of June 30, 1943, transferring the functions and powers of the Public Works Administration and of the Commissioner of Public Works to the offices of the Federal Works Administrator (where they were put in process of liquidation). The F. W. A. was estab. to consolidate those agencies of the Federal Gov. dealing with public works not incidental to the normal work of their depts. and which administered federal grants or loans to State and local govs. or other agencies for the purposes of construction. It was abolished by Act approved June 30, 1949, and its functions transferred to the General Services Administration.

**Works Representatives**, see SHOP STEWARDS.

**World**, see EARTH.

**World Bank**, popular name for the International Bank for Reconstruction and Development (q.v.).

**World Classics**, *The*, pub. since 1905 by the Oxford Univ. Press, was founded by Grant Richards, a London publisher in 1901 as a series of shilling reprints of standard works in all classes of literature, Eng. and foreign (the latter in translations). Charlotte Brontë's *Jane Eyre* was the first book in the list and sixty-six vols. had been included by the time the series was transferred to its present publishers in 1905. Among the distinctive features of *The W. C.* are its pocket size, maintained by the use of India paper for exceptionally long books, the high standard of typography and general production (particularly in more recent years), and the commissioning of new introductions by living authors of repute for many of the vols. Most of Tolstoy's works in the authorised Maude trans. have been included, and the revived interest in Trollope which reached its height during the Second World War was largely due to this series. Throughout the years balance has been kept between the older and the newer classics of all countries, the titles ranging from the *Iliad* and *Odyssey* of Homer to such contemporary works as Bernard Shaw's *Back to Methuselah*, issued as No. 500 in 1945 in a revised ed. with a new postscript by the author. In common with all other reprint series, *The W. C.* has been forced by rising costs to depart progressively from its original price, yet series of this kind continue to provide students and the general reading public with standard works at the lowest economic figure.

**World Council of Churches.** Movements towards Christian unity are expressing themselves in various organisations of which the World Council of Churches is one. The headquarters of the movement are in Geneva. The archbishop of Canterbury is (1950) one of the six presidents of the Council and the bishop of Chichester chairman of the central committee. The general secretary is Dr. Visser 't Hooft, and the Council held its first assembly in Amsterdam in Aug. 1948, at which there were representatives from about 150 Churches. The Rom. Catholic Church was not represented.

**World Food Council,** see under **FOOD AND AGRICULTURE ORGANISATION.**

**'World-Telegram,'** see under **'NEW YORK WORLD.'**

**World War, First.** This account treats of the 1914-18 War as a whole. Military operations are treated in detail under the various fronts or theatres of operations. Detailed accounts of European diplomacy and policy during and after the War will be found under **EUROPE**; while the effect of the War on the internal politics of the different nations is treated under the name of the nation concerned.

**CAUSES.—Intense Nationalism.—Industrial Unrest.**—In the early years of the twentieth century the countries of W. Europe had reached a high degree of material progress and prosperity. The great advances of scientific discovery had revolutionised industrial processes and brought great wealth to leading industrialists. There had been a corresponding improvement in the conditions of life of the wage-earners, though the parade of luxury by the rich laid the seeds of a resentment which was shown in strikes and occasional industrial unrest, and also in political action by the workers who now, with the increased facilities for popular education and the general extension of the suffrage, began to take a larger part in the affairs of gov.

The political organisation of the workers, however, was becoming identified with their industrial organisation in trade unions, and the entirely material objects of the organisations in the shape of higher wages and better working conditions led directly to an intense nationalism which counteracted the political movements. Trade unionists of one country saw the prosperity of their own trades threatened by the activities of foreign traders, and were ready to support tariffs designed to limit foreign competition. Tariff barriers led to trade jealousies between different nationals, and, combined with inherent political jealousies, constituted a latent danger to European peace. A greater element of danger, however, lay in trade expansion and the struggle for privileges in newly developing 'backward countries' such as the Balkans, Asia Minor, N. Africa, and in rival efforts to secure 'the road to the E.'

**Balance of Power.—Secret Diplomacy.**—At the beginning of the twentieth century, balance of power in Europe was no longer stable. Since 1870 Germany had rapidly

grown in military and industrial importance, and her imperial ambitions were regarded as menacing by Lord Lansdowne, then foreign secretary, who first threw over the policy of isolation by concluding in 1902 the Anglo-Jap. Treaty (q.v.)—thereby relieving Great Britain of large naval commitments in the Pacific—and by negotiations with the Fr. Gov., leading to the 'Entente Cordiale' of 1903—a defensive arrangement, at first, rather than an alliance. This was followed by a number of secret agreements between different countries, on which rumour was rife. Suspicion of bad faith naturally followed this secret diplomacy, and perhaps more than any other one factor these secret commitments endangered good international relationships.

**German Militarism.**—Emphasis was laid by the new rulers of Germany on 'blood and iron' and other incidental aspects of Bismarck's creed. The securing once for all of Germany's prestige was equally important to the great Ger. industrialists, for the efficient Ger. trade machine was built up on a none too stable system of credit. The Ger. people were not essentially 'militarist', but the most pacific of them were uneasy over their country's economic future and predisposed to some great effort to obtain security, and in this they were led by the new class of industrial magnates, the Prussian squirearchy, and the army and navy chiefs, the three most potent elements in Germany on the eve of the War, and all of them dominated by ideals of conquest. The countervailing element should have been found in the party of social reform, but the Social Democrats were politically powerless, for the Ger. constitution gave them no means of making their influence a reality. Equally significant from the international standpoint was the Ger. fear of the Russian menace—the 'barbarians from the E.'

The Ger. empire wanted producing grounds for its raw materials, 'a place in the sun,' outlets in colonial possessions for its surplus people. A colonial empire must be guarded by a powerful navy, and the navy, in process of expansion, was now an obvious threat to Brit. sea-power. Ger. power must combine Central Europe into a formidable bloc, with an extension of influence into the Middle E., where oil-fields were of rapidly increasing importance. Such were some of the theories underlying Prussian policy as expounded by the emperor; but his spectacular landing in Morocco in 1905 and proclamation of Germany's intention to take the Sultan under her protection was followed by the diplomatic defeat of Germany at the Algeiras (q.v.) Conference, when Germany found herself deserted by every Power save Austria-Hungary. Germany was more successful in 1908 in supporting Austria when, on the overthrow of the old régime in Turkey, Austria seized the Turkish provs. of Bosnia and Herzegovina which she had long administered. This action roused the apprehensions of Russia and Italy; but neither Russia nor Italy was in a position to take armed

action. In 1911, Morocco gave Germany further occasion for self-assertion. There had been a revolt in Fez, and the city had been occupied by Fr. troops. Germany saw her chance to acquire a Ger. sphere of influence in Morocco, and the emperor dispatched the gunboat *Panther* to Agadir in W. Morocco. Britain then sent a warship to Agadir, and under international pressure Germany retired.

*Effect of the Agadir Incident.*—This incident caused resentment in Germany against France and Great Britain, and it may be said that from that date the war party in Germany was supreme. This fact was not, however, generally recognised. In Feb. of 1912 Lord Haldane (q.v.) visited Berlin on behalf of the Brit. Gov. and discussed the whole international situation with the emperor and his ministers. He was convinced that their intentions were pacific. In 1914 the war party was in control of Ger. policy, awaiting a suitable opportunity for war; but the emperor probably did not realise the full implication of its attitude. Germany had to dominate Austro-Hungarian policy if she were to realise her dream of a solid bloc of Ger. influence through Central Europe towards the Middle E., which had been threatened by the successes of Serbia in the Balkan war. The aged Austrian Emperor, Francis Joseph, was content to rest his tottering throne on the might of Ger. arms, and Austria would never have taken the steps which plunged Europe into war if she had not been assured of Ger. support.

*The Sarajevo Murder.*—The actual occasion for war was in itself comparatively insignificant. The Austrian Archduke Francis Ferdinand (q.v.), nephew and heir of the emperor, and his wife, were assassinated by a Bosnian student, Gavrilo Princip, at Sarajevo, the Bosnian cap., on Sunday June 28, 1914. (See also SARAJEVO.) On July 5 a meeting took place at Potsdam, the result of which was that Germany promised to support Austria in whatever demands she might make upon the Serbian Gov. Russia alone of the Entente Powers had taken alarm at the possible international effect of the murders, and about this time a warning was sent to Vienna by Sazonoff, the Russian foreign minister, that any unreasonable demands by Austria upon Serbia could not leave Russia indifferent. But in spite of this warning, and of the report of the official Austrian investigator that the complicity of Serbia in the crime was not proved, the Austrian Gov. presented a drastic ultimatum to Serbia on July 23, requesting a reply within forty-eight hours. On the advice of Russia, Serbia, on the 25th, agreed to all the demands save two which clearly conflicted with her authority as a sovereign state. Serbia suggested that these two points should be referred to the Hague Tribunal. Austria-Hungary immediately informed Serbia that the reply was not satisfactory. The Austrian minister and his staff left Belgrade, and Austria-Hungary mobilised her S. armies and moved them towards the Serbian border.

*EVENTS IMMEDIATELY PRECEDING OUTBREAK OF WAR.—Diplomatic Exchanges.*—The week that followed the Austrian mobilisation was filled with frenzied diplomatic efforts to avert the widening of the area of conflict. Their efforts, however, failed, owing to the refusal of Germany to co-operate.

*Mobilisations.—Austrian Attack on Belgrade.*—On July 29 Russia mobilised her forces in the dists. nearest to Austria. On the same day Austria began the bombardment of the Serbian cap., Belgrade; the Ger. High Sea Fleet was recalled from the Baltic; Belgium began to prepare her defences; and concentration of the Brit. fleet began. Germany informed Russia that her partial mobilisation would compel Germany to mobilise, and this was represented by the inept Ger. ambas. in St. Petersburg, Count Portales, as an ultimatum meaning war. On the same evening the Ger. emperor and his advisers resolved to declare war on France and Russia; but before doing so they offered an assurance to the Brit. ambas. in Berlin, that, provided the neutrality of Great Britain was definite, the Ger. Gov. aimed at no territorial acquisitions at the expense of France should they prove victorious in any war that might ensue. Sir Edward Grey rejected these terms, as he was bound to do, but still delayed advising the Brit. Cabinet to take any step which might involve Britain in war.

On the following morning, July 31, news of the general Russian mobilisation reached Berlin, and Germany at midnight presented an ultimatum to Russia. At the same time Germany asked France for a notification by 1 p.m. the following day whether she intended to remain neutral in the event of a Russo-Ger. war. It was essential to the Ger. plan of campaign to involve France at the earliest possible moment, on the confident assumption that one swift blow would crush France and so leave the whole weight of the Ger. armies free to meet the Russians. War was now inevitable; but still the Brit. Cabinet refused to commit themselves to support France.

*British Obligations towards Belgium.—German Ultimatum to Belgium.*—When war between Germany and France seemed imminent, Sir Edward Grey asked for renewed assurances from both powers as to Belgian neutrality which both had guaranteed in 1839 (see QUINCEPPE TREATY). France gave the required guarantee, but Germany's answer was evasive, and contained a suggestion that Belgium had already committed certain hostile acts against Germany. At the Brit. Cabinet meeting on the morning of Aug. 1, it was decided to notify Germany that Britain could not ignore any threat to Belgian neutrality. On the following day Germany committed her first act of war when Ger. troops crossed the frontier into the Grand Duchy of Luxembourg and seized its railway system. This small state was not only practically unarmed, but her neutrality had been guaranteed by France and Germany. That Sunday

Ger. cavalry patrols crossed the border into Alsace as far as the vil. of Jonchéry and skirmished with Fr. pickets. Ger. dragoons raided the Fr. vil. of Suarce and took prisoner nine Fr. peasants. Early on the Monday morning before the declaration of war there was a Ger. raid near Lunéville, and a fight between Fr. troops and Uhlans at Réméréville. Still France behaved with restraint and kept her troops six m. behind the frontier. Meanwhile, on Sunday, Germany presented her ultimatum to Belgium in which she made the claim that the Fr. intended to march through Belgium, and Germany must therefore herself demand a passage through Belgium in order to counter this Fr. move. If Belgium would agree to allow passage to the Ger. armies and preserve a benevolent neutrality Germany would undertake to evacuate Belgian ter. at the end of the war and guarantee Belgian independence. Failing compliance, Germany would reluctantly be compelled to treat Belgium as an enemy. With the news of the Ger. ultimatum to Belgium, a change took place in the attitude of the Brit. Cabinet. At the Cabinet meeting on the Sunday morning, Aug. 2, Sir Edward Grey was authorised to assure France of Brit. naval support if the Ger. fleet came through the N. Sea or into the Eng. Channel to attack the Fr. coast. On Sunday evening the Prime Minister, Asquith, issued orders for mobilisation and summoned the Army Council to meet on Monday morning. On Monday, Germany declared war on France. Early that morning Belgium had sent her reply to the Ger. ultimatum, boldly rejecting the Ger. proposals, and stating her intention to resist any attack upon her rights. At the Brit. Cabinet meeting on that morning, Winston Churchill, First Lord of the Admiralty, announced that the Brit. navy was ready for war, and Lord Haldane announced the mobilisation of the army. On the morning of Tuesday, Aug. 4, Sir Edward Grey advised Belgium to resist a Ger. invasion by force, and promised to join France and Russia in supporting her.

**German Attack on Liège.**—Early that morning the Ger. invasion had begun. The frontier had been crossed at Gemmenich, and during the day Visé was burned and the forts at Liège were fired on. That evening Sir Edward Grey presented Britain's ultimatum to Germany, with a time limit which was to expire at midnight. No formal reply was given and at midnight on Tuesday, Aug. 4, 1914, a state of war automatically came into being between Germany and Great Britain.

**FIGHTING ON THE WESTERN FRONT IN 1914.—Fall of Liège.—Arrival of the B.E.F.**—The invasion of Belgium met with its first check at Liège, where the Belgians held up the Gers. for two days in front of the city. The city was occupied on Aug. 7; the forts around it were by Aug. 16 reduced by Ger. heavy howitzers. During the following week Ger. troops overran half Belgium. The main Belgian Army fell back towards Antwerp, leaving Brussels unprotected, and the Gers.

entered the cap. on the 20th. The fortress of Namur, the last barrier between the Ger. advance and the N. frontier of France, was soon reduced by the Ger. heavy artillery. The greater part of the S. Belgian Army was destroyed in the fall of Namur, and this was the first conspicuous success achieved by the Gers. in the war. Meanwhile the Fr. High Command remained in ignorance of the real weight of the Ger. drive. Acting on the Fr. theory that attack is the best defence, Gen. Joffre, the Fr. commander-in-chief, directed offensives into Alsace and Lorraine on Aug. 10. Both failed, and neither proved any distraction either to the Ger. right wing advancing through Belgium or to the Ger. centre advancing by way of Luxembourg and the Ardennes. The Fr. had therefore made no effective plan to meet the threat of the Ger. advance through Belgium when the small Brit. Expeditionary Force of some 150,000 men under Sir John French reached France. The first two corps of this force took their place on the left of the Fifth Fr. Army near to Mons on Aug. 22. The first two Brit. corps of some 70,000 men came into contact with the Gers. on Sunday the 23rd. On the 22nd the Fifth Fr. army had been attacked at Charleroi and had fallen back in some confusion. A breach was thus made in the Fr. line, and on the same day the Third and Fourth Fr. armies further to the E. had also retreated, leaving the Gers. free to attack the Brit. in force. Owing to the confusion, no information of these retreats reached Sir John French who faced the enemy under the impression that his troops formed part of an unbroken line, whereas they were completely isolated and facing a Ger. force two or three times the size of the estimate supplied by the Fr. to the Brit. when the latter took up their position.

**The Battle of Mons.—The British Retreat.**—The battle of Mons (q.v.) began with a bombardment from between five and six hundred Ger. guns, and Sir John French, now learning of the withdrawal of the Third and Fourth Fr. Armies, ordered the evacuation first of Binche and then of Mons itself. The Brit. retreat during the night was covered at dawn by a counter-attack by the First Division which suggested to the Gers. that the Brit. had been reinforced and intended an offensive. The plan of the Brit. commander was to retreat to a line giving his troops the protection of the fortress of Maubeuge and the R. Sambre on the right; but the protection of the Sambre was useful only if the Fr. could hold the Meuse and von Kluck could not outflank the Brit. on their left. In fact von Kluck had seized Tournai and the Meuse had been forced, and the three Fr. armies were in full retreat. Sir John French therefore continued to retreat to Le Cateau (q.v.). At nightfall on the 25th, the Brit. troops reached a line through Marolles, Landreies, and Le Cateau to Somainvillers near Cambrai. Some fierce fighting ensued, and at last the Brit. were able to regain touch with

the Fifth Fr. army to the E., with a new Fr. corps under d'Amade in the W., and also with another new Fr. army, the Sixth, under Gen. Maunoury (*q.v.*) on the Somme. On the evening of Friday, the 28th, the Brit. 2nd corps reached the R. Oise, and was at last reunited with Sir Douglas Haig's 1st corps, which had marched through Guise. The Brit. army was at last able to rest; by their remarkable endurance much had been saved, but many men, much material, and a considerable area of country had been lost.

To the W. Ger. cavalry now swept across Belgium as far as the R. Lys and down towards Lille and Arras, with the object of cutting communications between the Brit. army and its bases at Boulogne and Dieppe. So serious did the position appear to French, that he moved his base as far S. as St. Nazaire, the port at the mouth of the Loire. The Channel ports (*q.v.*) as far as the Seine lay open to the Gers.; but they had other plans. They were intent on destroying the Fr. armies by a series of hammer blows and hoped to dictate peace on their own terms before autumn. So far they had made rapid progress towards this object. The fall of Namur, the defeat of Lanrezac's Fifth Army at Charleroi, the battle of Mons, and the defeat of the Fr. on the R. Semois had been followed by the rout of Ruffey's and Langle's armies on the Meuse. On 28th and 29th Aug. the Gers. forced the crossing of the Aisne, and Rheims and Châlons were abandoned. On the 30th, La Fère and Laon were also evacuated. The Brit. retreat continued through the forests of Villers-Cotterets and Compiègne towards the R. Marne.

*British Halt at Grand Morin R.*—On Sept. 3 the Brit. reached the line of the Marne, but abandoned it further E. without resistance, and on the 5th the Expeditionary Force was concentrated behind the Grand Morin R. due E. of Paris and close to the city. Von Kluck's right wing began to veer away from Paris towards the S.E. His object throughout was to outflank the Allied left, and to avoid the obstacle of Paris until he had accomplished his main purpose. Still there was no certainty that the Marne could be held, and the Fr. Gov. took the wise but rather alarming step of retiring to Bordeaux in the S.W. The Fr. could feel secure on their right flank for the time being, for they were now in touch with their reserves, while the speed of the Ger. advance was slackened. Joffre decided to launch his offensive on Sept. 4.

Two new armies of reserves had been brought into the line, Foch's Ninth and Maunoury's Sixth, and two old armies had new commanders, Sarrail replacing Ruffey and Franchet d'Espèrey replacing Lanrezac. To the E., Castelnau and Sarrail stood almost back to back along the E. and W. heights of the Meuse above Verdun. On Sarrail's left was Langle's Fourth Army behind Vitry-le-François; and the line was continued westward by Foch's Army on the St. Gond marshes, that of Franchet d'Espèrey was linked by

cavalry to the Brit., who were guarded by the Crècy forests, and on the Brit. left, stretching north-westward across the Paris front, was Maunoury's new Sixth Army. Von Kluck erroneously believed he had practically disposed of the Brit. at Le Cateau and of Maunoury on the Somme, and that the Fifth Fr. Army had thus become the left wing of the Allies. By the night of Sept. 5 he had crossed the Marne, the Petit Morin, and the Grand Morin, and his patrols had reached the Seine.

*The Battle of the Marne.*—*The German Retreat.*—On Sunday, Sept. 6, the first battle of the Marne began. It reached its climax on the 9th, and was over by the 12th. Von Kluck, still acting on his mistaken assumption, invited disaster by marching across the front of the W. armies which moved out to attack his flank. By the end of the week the Gers. were driven back to a line running from the Oise beyond Compiègne to the Aisne, along that riv. to Berry-au-Bac, and across Champagne and the Argonne to Verdun. In Lorraine, also, Castelnau took the offensive and drove the Gers. back from Nancy to beyond the Meurthe, and out of Lunéville and St. Dié. The Ger. right had fallen back thirty-five m. and the centre nearly fifty; but their losses had been small. The battle was important because it frustrated the Ger. plan to destroy the Fr. armies, and so made certain a long war in which increasing advantage was to be on the side of the Allies. The retreat of the Gers. from the Marne had taken them across the Aisne, and the Allies followed up their advantage on Sept. 13 by attacking the Ger. positions along the line of the Aisne.

The battle of the Aisne (*q.v.*), began on Sept. 13. Both the Brit. and Fr. crossed the riv. at sev. points, but were unable to dislodge the Gers. from the high land beyond. The Gers. had the advantage in position, and Joffre accordingly extended his left by the creation of two new armies holding a line as far as Arras and Lens. At the same time the Gers. attempted to get behind the Fr. right in the Verdun area, but only succeeded in establishing a large salient which they were destined to hold for four years.

*Trench Warfare and Stabilisation of the Front.*—The lines began now to be stabilised between Rheims and the Alps, and both sides settled down to trench warfare, an almost entirely new method in which all old theories of war were discarded. Between Rheims and the sea the month of Oct. was spent in a struggle to determine where that part of the line would become stabilised. The Gers. moved great masses of their best troops to the W. area because they now realised that the Brit. Army was to prove an increasingly formidable opponent. Falkenhayn (*q.v.*) superseded von Moltke as Chief of the Imperial

*A map of the First Battle of the Marne is printed in the article*

MARNE. BATTLES OF THE

General Staff. Early in Oct. the Brit. Army was transferred to Flanders, close to its bases, to meet the Ger. threat to the channel ports. During the fortnight of the Brit. transfer, the Fr. had to bear heavy attacks in the W., with varying success. The struggle, which had begun as attempts at outflanking movement on both sides, soon developed into a race to reach the coast so as to establish the final position at as favourable a point as possible.

**Belgian Resistance and German 'Frightfulness.'**—The Allies hoped to be able to make a connection with the Belgian Army in Antwerp, which all this time had kept large Ger. forces occupied with raids. The Belgian successes so seriously interfered with their plans that the Gers. were provoked to vigorous methods, characterised in the Allied press as 'frightfulness' in order to overawe the Belgians, but the only effect of these methods was to stiffen the Belgian resistance. Among these measures was the systematic destruction of Louvain, with its anc. univ. and library; the bombardment of the cathedral and palais de justice at Malines; and the burning of Termonde. On Sept. 28 the Gers. began the siege of Antwerp.

**Fall of Antwerp. First Battle of Ypres.**—The ring of forts round Antwerp failed to hold up the Gers., and the evacuation of the city began by land and sea on Oct. 7, and on the 10th the Gers. entered the almost deserted city. In fixing the lines along which the opposing armies were to remain, with small fluctuations, for four years, the Brit. navy played an important part, for the guns of three shallow-draught monitors from the 18th to the 28th Oct. swept the Belgian coast for 6 m. inland and held up the Ger. advance on Nieuwpoort. But still more decisive in stopping the Ger. advance was the action taken by the Belgians (in imitation of the ancient tactics against the Sp.), when they opened the sluices of the Yser at Dixmude and allowed the water to flood the country over which the Gers. were advancing. The Belgians on the line from Nieuwpoort to Dixmude were protected by an impassable sheet of water. The Gers. succeeded in capturing Dixmude on the E. bank of the Yser, but they were unable to cross the riv. Meanwhile a great battle had been waged around Arras, where the Gers. tried to break through in the hope of isolating the Brit. Although the tn. was reduced to ruins, the Fr. finally drove back the Gers. on the 26th. At the same time a prolonged and confused battle was raging round Ypres. The final attack on Ypres itself began on the 21st (see YPRES, FIRST BATTLE OF). With the arrival of reinforcements for the Fr.

on Nov. 17, the Gers. gave up their attempt to break the line, which now settled down for the winter.

**Results of the Campaign.**—Germany had secured the great mining and other industrial resources of Belgium and some of the coalfields of N. France, and the loss of these was to put a great strain on the Allies and prolong the war, but Germany required time to make use of her gains. Brit. and Fr. losses had been very heavy and time was needed to renew them. The chief difficulty for Britain was to train and equip the masses of recruits from all parts of the empire in a short space of time. The Territorial Army, created by Lord Haldane, provided the first line of reserves. Although recruited for home defence, its members volunteered almost without exception for foreign service. From all parts of the empire, also, recruits were arriving, a tribute to the solidarity of the bonds of the empire. Indian troops fought at Ypres, and the first Canadian contingent landed at Devonport on Oct. 16, to be followed by thousands from Australia and New Zealand and finally from S. Africa, where for the moment the task of repressing rebellion and fighting in Ger. S.W. Africa kept the S. African volunteers occupied.

**THE EASTERN FRONT IN 1914. Russian Invasion of East Prussia.**—It had been generally assumed that Russia's unwieldy masses could only be moved very slowly, but that later on her immense resources of men and material would prove formidable. In the event, Russian troops invaded E. Prussia almost as quickly as Ger. troops invaded France and Belgium, and by the end of the first week in Aug. a fight towards Berlin had begun. Russia's Polish prov. was an almost impossible salient to defend, and her first need, therefore, was to attack on the flanks in E. Prussia and Galicia, in order to straighten her front. The Russian armies were under the supreme command of the Grand Duke Nicholas, who was one of the very few officers of royal blood to prove himself a competent professional soldier, and Rennenkampf was the general in command of the Russian 1st Army in the E. Prussian campaign. On Aug. 20 the Russians captured Gumbinnen, and Rennenkampf occupied an important railway junction at Insterburg, while on the 21st Samsonov, commanding the Russian 2nd Army operating to the S. in E. Prussia, turned the Ger. right and drove them back from Königsberg to join the fugitives from Rennenkampf's attack. By the 25th E. Prussia was open to the Russians and alarm in Berlin was intense. Meanwhile, Austria, although she had a million troops in Galicia, had failed to secure more than a strategic retirement of the Russians by her offensive against Lublin, and the Russians under Ruzsky and Brussilov (*q.v.*) had overrun the E. borders and menaced Lemberg (Lvov). But the Russian advance into E. Prussia had reached its furthest point. The Gers. withdrew the incompetent Gen. von François, and replaced him by Paul von Hindenburg, with Ludendorff as his

*A Map of France and Flanders  
1914-1918*

*is printed in the article  
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chief of staff. On the 31st he practically annihilated the Russian forces under Samsonov at the battle of Tannenberg (q.v.).

*German Invasion of Russian Poland.*—*Russian Advance into Galicia.*—*Rennenkampf*, with his communications now threatened, was compelled to retreat over the frontier and the invasion of E. Prussia had disastrously failed. Hindenburg now advanced across the Russian frontier without encountering any great resistance on a broad front from Wirballen on the left to Augustowo (Augustow) on the right, and occupied Suwalki, the cap. of the frontier prov., without resistance. But in the S. the position was much more favourable to Russian arms. (See RUSSIAN FRONT (FIRST WORLD WAR), CAMPAIGNS ON). Gen. Brussilov, advancing from the S., captured in succession Tarnopol and Halicz, and forced his way across the series of rivs. guarding the right flank of Lemberg and on Sept. 1 the battle of Lemberg began. The city fell on Sept. 3, and the whole Austrian Army then fell back behind the Vistula and the San. Von Auffenberg, who had defended Lemberg, withdrew to the fortress of Przemyśl, and the whole of the rest of Galicia was in Russian hands by about the date of the battle of the Marne in the W., so that the combined strategy in E. and W. had achieved substantial results for the Allies. Meanwhile Hindenburg in the N. continued his advance into Russia until he reached the Niemen; but there the vigorous Russian artillery attack and the inability of the Gers. to find emplacements for their guns in the marshy ground checked him. The check became a retreat on Sept. 27, a retreat during which the Russians inflicted heavy losses.

*The Struggle for Cracow.*—By Oct. 1 the Russian cavalry were again across the Ger. frontier. Jaroslav fell and Przemyśl was invested, and Hindenburg was called S. to Poland to repel the Russian advance on Cracow. The need was urgent, for the possession of Cracow would open the door to Silesia, and give access to Vienna. Ruskzy was now in command in Poland, and Ivanov, with Brussilov and Dmitriev as his lieutenants, in Galicia. Hindenburg's plan was to attack along the radial railway lines leading to Warsaw from Thorn (Torun), Kalisch (Kalisz), and Czeszochowa, while the Austrians made an advance through Galicia, relieved Jaroslav and Przemyśl, and recovered Lemberg. The Grand Duke Nicholas foresaw Hindenburg's intentions, but concealed his own counter-plan by giving the appearance that he was about to retire from the Polish salient. Actually he proposed to hold a position behind the line of the Vistula, except for Warsaw, which stands on the l. b. of that riv., and to counter-attack round the N. of the Ger. left wing under the great fortress of Novo Georgievsk. On Oct. 19 he made this surprise move, forced back the Ger. left, and threatened the Ger. centre. By Nov. 3 the Gers. were in retreat, abandoning even Łódź, and destroying

communications as they withdrew. The Austrians whom Hindenburg had come S. to help were, unusually enough, the more successful in their offensive, recovering Jaroslav, relieving and re-occupying Przemyśl, and threatening Lemberg; but the Ger. retreat to the N. then compelled the Austrians to retire in Galicia. The Russian advance on Cracow was resumed, and by Nov. 9 their cavalry was only 20 m. from the city. A week before the Prussian Guard made its final attack at Ypres, Belgians had reported the moving of masses of Ger. troops away to the E. The need was urgent, for Cossacks were already across the Silesian border, and Hindenburg required all the help he could get for a counter-offensive. He was planning an attack up the Vistula from Thorn so as to attack the right flank of the Russian advance through Poland on Silesia and Cracow. The command was given to Mackensen. The Gers. attacked all along the line on Nov. 18 against Ruskzy. The Russian centre was broken, and the left thrust back upon Łódź. But the wedge driven into the Russian line was not wide enough and the sides held fast, and Ruskzy began to close the Gers. into a trap. For three days, Nov. 24 to 26, they fought desperately to extricate their forces, and at length the remnant succeeded. Meanwhile the Gers. were rushing troops to Mackensen, and on Dec. 6 the Russians withdrew from Łódź in order to straighten their line against the attack Hindenburg was preparing on Warsaw. But the Ger. advance was now held and the Gers. spent Christmas in the trenches, 35 m. from Warsaw. Meanwhile the Hungarian advance in Galicia, which was another part of Hindenburg's plan, met with better success, and the Russians were driven back from Cracow, but with reinforcements they swung forward again.

*German Attack on Warsaw.*—During Jan. 1915, the Russian centre in front of Warsaw was weakened in response to requests from the W. Allies that Russia should divert Ger. troops from the W. front by attacks on the extreme flanks of the Ger.-Austrian lines in the E. There was a fresh advance towards the Masurian Lakes in E. Prussia, and far to the S. Alexeev captured a Carpathian pass. Mackensen took advantage of this dispersal to make a fierce attack on the Russian centre. The attack began on Feb. 1, but the Russians were able to hasten reinforcements by the two lines of railway which ran N. and S. of the threatened front, and the Ger. advance was stopped. Hindenburg now gave up the idea of a frontal attack and tried to repeat his attempt on the northern flank to pierce the great chain of fortresses which defended Poland along the line of the Niemen and the Narv. from Kovno to Novo Georgievsk. In this he was not successful, and by the middle of March had withdrawn his left and centre to cover the Prussian frontier. On the Carpathian front, Russia, endeavouring to bring Rumania into the war on the Allied side, sent a force into the Bukovina. The fighting on this front continued with varying

fortunes until on March 22 Przemyśl surrendered to the Russians. After the fall of Przemyśl the Russians were free to make further assaults on the Carpathians, at first with success; but the Gers. had taken charge of the Carpathian front and had sent enormous reinforcements there, while the weakness of Russia in guns and material was beginning to make itself felt.

**SERBIA IN 1914.**—Austria's difficulties had been by no means confined to the Russian front. Her 'punitive expedition' against Serbia (*q.v.*) had been disastrously unsuccessful. By Dec. 6, the whole Austrian Army was broken and in flight. They suffered 80,000 casualties before they were driven back from Serbian soil, leaving Belgrade once more in the hands of the Serbs.

**SOVEREIGNTY OF THE SEAS AND AIR RAIDS.**—*German Seaborne Commerce Destroyed.*—The control of the seas did not ensure complete protection of all the Allied coasts from Ger. raids, but it did ensure freedom of movement for the Allies at sea, and its chief importance was an economic one, enabling the Allies to draw for their supplies upon the whole world, while denying the same advantages in provisioning to the Central Powers. The Ger. High Sea Fleet had withdrawn to its bases on the outbreak of war, and the Ger. plan was to wear down the Brit. navy by a war of attrition with submarines and mines.

Meanwhile the Brit. Grand Fleet under Adm. Sir John Jellicoe (*q.v.*) was compelled to operate in the N. Sea from inadequate bases, while the outlying cruisers in various parts of the world cleared the Ger. mercantile marine from the seas. Some Ger. merchant vessels escaped to neutral ports; but hundreds were made prizes. In a very short time Ger. seaborne commerce ceased to exist. A few Ger. cruisers and armed merchantmen were still at large, and one Ger. Dreadnought, the *Goeben*, with a cruiser, the *Breslau*, escaped to take part in the war later on. (See 'GOEBEN' AND 'BRESLAU'.)

Mines and submarines proved from the first the greatest danger to Brit. shipping. The Gers. adopted the method of laying loose mines, which was contrary to accepted rules of war, as involving risk to neutrals and belligerents alike. The first serious naval action by the Brit. during the war was the fight in the Bight of Heligoland on Aug. 28, in which Vice-Adm. Beatty's battle-cruisers came up to support Brit. light craft and, successfully penetrating the mine-fields, sank the Ger. cruisers *Mainz* and *Köln*. Meanwhile Japan had taken her first step in the war by calling upon Germany to evacuate her Chinese naval base at Tsingtao in the Kiaochow peninsula, and to send her warships out of Far E. waters. The Ger. Pacific squadron under Adm. von Spee left Tsingtao in anticipation of the capture of that port by the Jap., an event which actually took place on Nov. 7. Already Australian troops had occupied Ger. New Guinea, the Bismarck Archipelago, and

the Gilbert and Caroline Is., while Samoa surrendered to a New Zealand force, and the Marshall Is. to Japan. Von Spee was thus left without a naval base, and he steamed eastwards across the Pacific detaching two of his cruisers, the *Königsberg* and *Emden* to help the Gers. in E. Africa and to raid Brit. commerce in the Indian Ocean. On Sept. 20 the *Königsberg* sank H.M.S. *Pegasus* at Zanzibar, but was soon entrapped in the Rufiji R. The *Emden*, under Capt. Müller, remained to demonstrate the possibilities of a solitary raider commanded with gallantry. (See 'EMDEN'.)

**Battle of Coronel—Battle of Falkland Islands.**—Meanwhile von Spee had gained the S. Amer. coast and found shelter in its harbours and is. His squadron of two large and three small fast cruisers was opposed on Nov. 1 off Coronel by Adm. Cradock with a mixed squadron of old and slow vessels. Adm. Cradock and 1600 officers and men lost their lives in this action, and none was rescued by the Gers. (see CORONEL, BATTLE OF). Lord Fisher (*q.v.*) as first sea lord of the Admiralty took prompt measures to avenge the defeat. On Nov. 5 he despatched a squadron under Adm. Sturdee, comprising two battle-cruisers and four lighter cruisers. They picked up the *Magow* in the S. Atlantic, and the *Canopus* at the Falkland Is., which Sturdee reached on Dec. 7. Unaware of the presence of Sturdee's squadron, von Spee approached the Falkland Is. on Dec. 8 to be chased by Sturdee, who sank all his vessels, with the exception of the *Dresden*, which was sunk in March 1915 (see also FALKLAND ISLANDS, BATTLE OF). These two actions clearly demonstrated that weight of metal was to be the deciding factor in naval actions, as it had been in the past. The last Ger. cruisers outside their own harbours were now destroyed, and naval action was restricted to blocking the exits from the N. Sea and preventing Ger. raids from their bases. Meanwhile on Oct. 29, Bedouins invaded the Sinai Peninsula, while Turkish gunboats raided Odessa, and on Nov. 1 the Brit. ambas. left Constantinople, being unable to outbid the Gers. for the support of the Turkish leaders. The first effects were seen in Egypt, where the Khedive threw in his lot with the Turks and was deposed in his absence, the Brit. assuming the protectorate; and in Cyprus, which the Brit. had occupied since 1878, but which they now formally annexed.

**German Colonial Empire Conquered.**—The smallest African outpost of Ger. colonisation, Togoland, surrendered on Aug. 27. The Cameroons, larger in area than Germany, repulsed the first Allied attack; but on Sept. 27 co-operation between Fr. troops and Brit. warships effected the capture of the cap., Duala, and the whole coast-line. The conquest of Ger. S.W. Africa was much more difficult, and was delayed by a serious revolt in the Union of S. Africa, organised by the Boer leader, Maritz, with assistance from de Wet and Beyers. Gen. Botha took prompt steps to deal with the out-

break, and after small rebel successes de Wet was captured on Dec. 1: Beyers was drowned on the 8th while in trying to cross the Vaal R. Attacks on Ger. E. Africa in 1914 met with serious reverses, and it was to take the Brit. forces four years to secure its final surrender (see AFRICA, GERMAN EAST, FIRST WORLD WAR, CAMPAIGN IN; AFRICA, SOUTH-WEST; CAMEROON).

**German Raids on British Coast.**—Two Ger. naval raids on the Eng. coast took place towards the end of 1914. On Nov. 3, Ger. cruisers made an abortive attack on Great Yarmouth, but on Dec. 16, Ger. battle-cruisers carried out a bigger raid on the N.E. coast, evidently with the object of scaring the Brit. civilian pop. into demanding stronger measures of coast defence and thereby holding back forces

women and children, and some of them Amers.

**German Air-raids.**—During the winter and springs of 1914-15 air-raids began to play a considerable part in the war. There was a Brit. seaplane raid on Cuxhaven on Christmas Day 1914, and the Fr. carried out sev. air-raids on military objectives in Germany; but the Gers. made use of air-raids over Britain principally to sow panic among the civil pop., and air-ships were the means generally employed, as they were capable of long cruises and of carrying a great weight of bombs.

**ALLIES AND THE NEAR EAST.**—**British Attacks in the Persian Gulf and the Dardanelles.**—The Brit. resort to Turkish attacks on the Suez Canal was made in the Persian Gulf and the Dardanelles. Good use was made of the Indian



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required elsewhere. Scarborough, Whitby, and the Hartlepoons were bombarded. On Jan. 24, 1915, Adm. von Hipper came out with battle-cruisers and light cruisers, probably with the object of luring the Brit. fleet on to the mine-fields he had prepared off Heligoland, and an engagement took place near the Dogger Bank between the Ger. cruisers and Adm. Beatty's battle-cruisers. One Ger. cruiser, the *Blücher*, was sunk, and one Brit. cruiser, the *Lion*, was damaged; but the Ger. vessels, after a severe battering, escaped through their mine-field. The result of the engagement was indecisive, but it left no doubt about the command of the seas.

**American Attitude towards British Blockade.**—During the spring of 1915 considerable resentment was aroused in America by the Brit. blockade of Ger. ports, which interfered with Amer. shipping, and there was criticism of America in England; but the situation was radically changed by the colossal blunder of the *Lusitania*. It was on May 7 that this passenger liner was torpedoed off the S. coast of Ireland with the loss of 1100 people, many of them

Army in an attack on the Turks at the head of the Persian Gulf. The Turks made little headway against the Brit. advance, and in April 1915 they suffered a heavy defeat with some 6000 casualties, with the result that the Arabs became converted into allies of the Brit., and the way was now open for a Brit. advance on Bagdad. But successful operations in the Persian Gulf were of minor importance compared with the threat to the heart of the Turkish Empire involved in the Dardanelles expedition. Attack on the Dardanelles was the best defence of the Brit. position in Egypt; Allied success there would almost certainly bring in Rumania on the Allied side with all the advantage of an extended line of attack, and might deter Bulgaria from hostile intervention and even induce her to join a Balkan alliance against the Turkish and Ger. power. Italy's position as a member of the Triple Alliance who had not yet taken up arms with her Allies was also an important consideration. During the winter and spring of 1915 prolonged diplomatic efforts were directed to the task of bringing in Italy on one side or the other.

*Italian Diplomacy.*—Under the terms of the Triple Alliance, Austria and Italy had promised each other reciprocal compensation in case either was forced to disturb the *status quo* in the Balkans. In March 1915 Baron Burian finally accepted the principle that compensation was due to Italy, and the It. Gov. proceeded to extend its demands to include not only the whole of *Italia irredenta*, but practically the whole N.E. coast of the Adriatic. It was obvious that these claims could not be met by the Allies if they won the war, because they would involve concessions at the expense of the Serbs and of the other Slav races in Bosnia-Herzegovina (*q.v.*); but the value of her participation seemed to the Entente worth the risk of later difficulties, and on April 26 the Treaty of London was concluded which conceded to Italy most of her demands. But she still remained at peace with Germany for another year; and although she declared war on Austria on May 22, she confined her efforts to attempts to secure the ter. at which she aimed. After some slight initial successes Italy did not seriously hamper the Austrian effort, and there were diplomatic difficulties arising from her intervention, particularly in Greece, which had serious consequences to the Entente Powers. King Constantine of Greece, married to the Ger. emperor's sister, and strongly pro-Ger. in his sympathies, was to prove a continual thorn in the side of the Entente, and he was unlikely to assist powers allied with Italy in view of Italy's claims to Gk. is. The Serbs showed their feeling against Italy when that country intervened on the Allied side by making a dash for the Adriatic coast claimed by Italy (*see also* ADRIATIC QUESTION). In the meantime the Dardanelles expedition had suffered from divided counsels and was to prove a disastrous waste of men and material. The expedition was foredoomed to failure by the fact that the Turkish batteries which defended the straits were more than a match for any naval guns. The Fr. could not spare any of their troops from the W. front, and probably it was hoped to secure the co-operation of Gk. troops, but these were withheld by the opposition of the Prussian queen of Greece.

*The Dardanelles and Gallipoli.*—The purely naval attack began on Feb. 19, 1915, and three successive squadrons of Brit. and Fr. ships were sent up the straits, only to meet Turkish floating mines and land torpedoes which were so effective that one Fr. battleship, the *Bouvet*, with most of her men, and two Brit. battleships, the *Irresistible* and *Ocean*, were sunk. On April 25, the second attempt to force the straits began, when an Anglo-Fr. force, including two Australian and New Zealand divs., under Gen. Sir Ian Hamilton, attempted landings. The result of this first attempt at landing was to give Hamilton possession of the extremity of the peninsula and of an exposed ridge of cliffs at Gaba Tepe, which was later named Anzac Cove; but he had failed in the hope of inflicting a surprise defeat on the Turks, and the struggle for Gallipoli

resolved itself into a costly attack by inferior forces on land against almost impregnable positions. When a second attack was made on May 6-8, the naval guns of the supporting fleet failed to destroy the Turkish trenches and an advance of one thousand yds. was achieved only at the price of losses in men amounting by the end of May to more than the total Brit. losses in battle during the S. African war. A third attack on June 4 confirmed the impression that nothing short of a large army could master the position. After further naval losses the *Queen Elizabeth* and the other more important battleships then withdrew to safer waters, and the naval attempt on the Dardanelles was gradually transformed into a land siege of the peninsula. (*See also* under DARDANELLES and GALLIPOLI CAMPAIGN).

THE EASTERN THEATRE OF WAR IN 1915.—*Mackensen's Galician Drive.*—During 1915 the centre of importance in the conflict shifted from the W. to the E. front. Germany saw that the enemy she could most easily defeat was not France but Russia, for Russia was badly equipped with munitions at the outset and had not the industrial organisation to make good the defect. Russia's vast Polish salient was a further weakness: it was protected by the Carpathians on the S., and the passes were extremely difficult for the transport of heavy artillery; but if once the Gers. could make an advance in Galicia the Carpathians would be useless and the Russian armies in Poland exposed. Mackensen began his advance on April 28 with an attack on Dmitriev's left at Görlitz (Zgorzeke), so that the Russian gen. was compelled to weaken his centre along the Biala in front of Cieszkowice. Then on May 1, the Gers. long preparation of munitions took effect in an overwhelming bombardment of the Russian positions. The Russian defences were completely destroyed, and the Russians could make little reply, so that the Gers. were able to cross the Biala and to capture Cieszkowice and Görlitz, and to break Dmitriev's line. On the 2nd, Dmitriev was in full retreat to the R. Wisłoka, 20 m. in the rear, where no position had been prepared, and Mackensen forced his way across the riv. on the 7th and pushed on still further. This advance compelled Brusilov's Army to retire hastily from the edge of the Carpathians and, in the retreat, his losses were heavy. For the rest of the month Mackensen advanced irresistibly. By the 18th he had captured Kosziowa and seized the line of the San from Sieniawa to Jaroslaw, and on June 1 Przemyśl was evacuated.

*The Fall of Lemberg.*—At the battle of Rawa Ruska on June 20, Mackensen cut the Russian communications N. of Lemberg and the cap. of Galicia once more fell into Austrian possession on the 22nd. After the fall of Lemberg the Russians lost the line of the Dniester as far as Halicz (*q.v.*) and the country beyond it, including the Bukovina (*q.v.*). They fell back on the Gnilia Lipa, where

Ivanov offered a prolonged resistance. But the Ger. advance had achieved all its objects except the complete defeat of the remnant of the Russian armies in Galicia, and their front was now swung round to face N., where the Russian armies in Poland were outflanked. A corresponding advance had been made by von Bulow on the N. of the great Polish salient. Libau had fallen on May 9, and during that and the following month the Gers. occupied the duchy of Courland as far as Windau on the coast and Shavli, half-way to Riga.

*German Offensive in Poland.*—The Gers. planned to outflank the Russian position in Poland by striking at Vilna from the N., with a naval attack on Riga as part of the campaign. Mackensen's Galician armies had first to face N. so as to take their part in Hindenburg's general plan by driving back the Russians across the railway between Lublin and Kovel. Only a few days after the capture of Lemberg these armies proceeded to carry out this turning movement. They were joined on July 16 by von Gallitz, with a movement on the extreme N. of Poland, and on the 30th the Gers. captured Lublin and Cholm. The fall of Warsaw could now no longer be avoided. On Aug. 4 the Russians abandoned the lines at Blomie and marched through the city, blowing up the bridges over the Vistula as they went. Next day Prince Leopold made his entry.

*Russian Bureaucratic Incompetence.*—The incompetence and corruption of Russian bureaucracy was beginning to have even more serious effects than the loss of Poland. Before the war much of Russia's industrial and transport organisation had been in Ger. hands, and after the war began much of it was still left in Ger. control through almost incredible stupidity or treachery. The shortage of munitions was so great that the artillery of one army was limited to two shells a day, while one whole division had on one occasion to face an attack without a single rifle. The withdrawal from Warsaw was the first step in the Grand Duke Nicholas's projected retirement from the whole Polish salient, and he hoped that his flanks would hold out long enough to enable the main retreat to be effected safely. He left a strong garrison at Novo Georgievsk to hamper the Gers.; but the most dangerous point was on the line of the Narva where von Bulow was about to attack the fortresses. On Aug. 10, Lomza was captured, and on the day that Warsaw was taken the bombardment of the most important of the Narva fortresses, Kovno, began. Kovno was the angle of the Russian base, and the loss of it would also make it easier for von Bulow to complete his wheeling movement by way of Vilna so as to threaten the Russian communications. Kovno fell unexpectedly soon, on the 17th.

*The Russian Retreat.—German Blow at Vilna.*—After Kovno other fortresses fell rapidly, Novo Georgievsk on the 19th, Oskowice on the 23rd, and Brest-Litovsk, the centre of the Russian base-line in

Poland, on the 26th. On the same day Augustovo (q.v.) was evacuated and Bialystok (q.v.) captured. On Sept. 2 the Russians abandoned Grodno, leaving the whole line from Brest-Litovsk to Kovno in the hands of the Gers. The Russians were driven back into the Pripet Marshes, which were at their driest at this season, so that they presented few obstacles to the advance eastwards of Mackensen from Brest-Litovsk, with the result that he quickly reached Pinsk on the railway to Moscow. In Galicia Ivanov was driven back to the Sereth, and in the far N. von Bulow was advancing on Mitau and Riga, thus threatening the Vilna-Petrograd railway and forcing the Russians to continue their retreat along narrow lines of communication which would inevitably become congested. The main Ger. effort was now directed towards Vilna. On the 13th the Russians began to evacuate Vilna, and by the 17th reinforcements of Ger. cavalry had travelled as far as Vileika, nearly 50 m. E. of Vilna, and were threatening the Russians retiring from that city. At this critical moment Ruszky was restored to command of the N. Russian armies and succeeded in relieving the position, and in gradually straightening the lines so that they ran nearly due S. from Dvinsk by Postavy, Lake Narotch, and Smorgon. In the S. the Ger. forces were also driven back. On Sept. 7, Ivanov counter-attacked Mackensen's advancing forces from Rovno, and Brusilov and Lechitsky counter-attacked on the Sereth.

*WESTERN FRONT 1915.—The Spring Offensive.*—In the W. the old idea that separate attacks would defeat the Gers. still persisted, and there was no effective co-operation between the attacks at different points along the front. The Fr. offensive began in the Woëvre, while the Brit. began at Neuve Chapelle, a mile at the foot of the Aubers ridge. There was a Ger. salient there, and if the ridge could be carried it would threaten the Ger. hold on Lille, and might cut off La Bassée and straighten the line. The attack began on March 10, with a concentrated effective artillery bombardment. On the Brit. centre and right the 11th Corps and the Indian Corps were enabled by this preparation to advance beyond Neuve Chapelle as far as the slopes of the Aubers ridge; but the total gain to the Allies was only a mile, and a strip of land 3 m. by one. (*See NEUVE CHAPELLE*) The Fr., however, were rather more fortunate, but their successes in the Woëvre and Alsace were local and were of no greater value than the Brit. to the general plan of campaign. Early in April they gained the plateau of Les Éperges and advanced towards Étain on the road from Verdun to Metz, while they made some progress between St. Mihiel and Pont-à-Mousson. In Alsace they took Sondernach and advanced during April towards Metzeral and Münster, and recovered the summit of the Hartmannswellerkopf. The failure of the Russian offensive at this time made it essential to try some plan which would prevent the

Gers. sending more troops from the W. to the E., and the point chosen for the Allied activities was Lille, a great railway centre and important as protecting both the right of the Ger. line along the Aisne and the left on the Belgian coast.

**German Gas Attacks.**—The Gers., however, anticipated this move and began a counter-offensive against Ypres which was probably not intended as a major operation, but gave them the opportunity to try the use of chlorine gas on the evening of April 22. This proved a formidable surprise to the Fr., Brit., and Canadian troops along the Yser Canal. The gas attack N.E. of Ypres coincided with an attack on Hill 60 (q.v.) at the S.E., which resulted in some of the fiercest fighting of the whole war. By the 23rd the Gers. had crossed the canal at Het Sas and Lizerne, and the Canadians were fighting on three fronts between St. Julien and Graefenstafel. On the 24th the Gers. made another gas attack and St. Julien was abandoned. But reinforcements were on the way, and Fr. regulars recaptured Lizerne and Het Sas and secured the W. bank of the canal against a further Ger. advance; while, on the 29th, the Canadians, who had saved the position at considerable loss, were relieved by Brit. troops. Fighting continued for a considerable time longer, and it became necessary to shorten the Allied line, an operation which was safely effected on May 3 and 4. Heavy bombardments continued until the 24th, when a final gas attack by the Gers. concluded the main effort. Crude respirators had by this time been served out and the gas did less damage than on the earlier occasions. The Ger. offensive around Ypres now slackened to meet Allied attacks beginning on the Ger. positions in front of Lens and Lille. To protect Lens the Gers. had constructed massive fortifications at the foot of the S.-W. slope of the Vimy Ridge, which ran in front of Lens. These fortifications were known as the Labyrinth and the White Work. The Fr. had collected eleven hundred guns and an immense supply of munitions for the most concentrated bombardment so far made. The bombardment was successful in clearing the way for the infantry, who captured La Targette and the White Work and entered Neuville St. Vaast. Not until the 12th did they capture the summit of Notre Dame, and another fortnight elapsed before they secured the Souchez sugar refinery, while the Labyrinth still held out, and for two years more Vimy Ridge remained in Ger. hands. The Ger. lines had been broken, but once more the lesson was driven home that small local successes were of little value when the main line was still held. Two further Allied attempts during May met with similarly disappointing results, at Fromelles and Richebourg l'Avone.

**Coalition Government formed in Great Britain.**—An outcry now over the lack of munitions led to the reconstruction of Asquith's gov., with Lloyd George as minister of munitions, and at the same time Lord Fisher (q.v.) resigned from the

admiralty. He had been at loggerheads with Winston Churchill over the Dardanelles expedition, and, on his resignation, Asquith formed a coalition gov. in which were included the principal Conservative leaders, and one or two Labour leaders. Churchill left the admiralty, and Lord Haldane (q.v.) was removed from the post of lord chancellor. By the autumn of 1915 the relative strengths of the Gers. and Allies on the W. Front had become much less unfavourable to the Allies, largely on account of the withdrawal of Ger. troops to the E.; while the Allies had secured a still more marked superiority in guns and munitions.

**Western Front in the Autumn of 1915.**—

It was this superiority which encouraged the Allies to undertake renewed offensives in Sept. The Brit. had taken over some 30 m. of what had been the Fr. front and had now a million men in the field, while the Fr. had two millions. But the Brit. front was not continuous. Plumer's Second and Haig's First armies held the line from Ypres to the S. of La Bassée, but d'Urbal's Tenth Fr. Army intervened between Haig and the new Third Brit. Army stretching from Arras to the Somme. On the Brit. front a secondary attack was planned, but the main attack was to take place in Champagne, with the intention of breaking the Ger. communications from E. to W. along the Aisne. (See AISNE, BATTLES OF THE.) The Fr. took most of the Ger. front-line trenches and some of their second line, capturing thousands of prisoners and scores of guns. They captured the Butte de l'abbaye, commanding the Bazancourt-Challange railway, which it had hoped to break; but on Oct. 30 the Gers. recaptured this position, and the Fr. were left with the doubtful net advantage of an advance, at some points, of 2½ m., having inflicted, however, greater losses on the Gers. than they had themselves suffered. The attacks between Ypres and Arras produced approximately similar results. The battle of Loos (q.v.) was the prin. Brit. effort. The Brit. took and held Loos, but failed in their major object of securing Lens. The defeat was partly due to the delay in the advance of d'Urbal's Fr. Army, which failed to make headway until the 26th, when they took Souchez together with most of Givenchy Wood and Thelus. On the 28th they made some progress up the slopes of the Vimy Ridge. Attacks and counter-attacks during Oct. led to little result, and the line was gradually stabilised for the winter with but small changes to compensate for the cost of the great Allied offensive. In Dec. Sir John French was recalled. A brilliant cavalry leader, he was not the ideal commander-in-chief for a war of attrition.

**THE NEAR EAST, 1915-16.**—**Gallipoli and the Dardanelles.**—During June 1915 heavy Turkish attacks with fresh troops were repulsed; but Sir Ian Hamilton could do no more than hold grimly the positions already occupied until the end of July when reinforcements arrived. In July a new type of monitor had been

evolved with little exposure to submarine attack, and capable of throwing heavy shells 12 m. These were to take their share in the naval part of the new plan which had been decided on. This plan involved four separate actions. A feint was to be made at the head of the gulf of Saros, as if to take in flank and rear the Turkish lines crossing the neck of the peninsula at Bulair. Next, a strong offensive was to be resumed by the troops in the Cape Helles region against their old objective, Achi Baba. It was hoped that these two movements would lead the Turks to send their reserves to Krithia, in front of Achi Baba in the toe of the peninsula. Meanwhile the Anzac corps were to advance and to attempt to gain the heights of Koja Chemen; while to the left again a great new landing was to be made at Suvla Bay, just at the angle of the gulf of Saros with the Aegean. The preliminaries to the main assault began when the Allied forces at Cape Helles on Aug. 6 made a general attack on Achi Baba. For the next three days fighting continued, principally in the centre. This engagement was intended to distract the Turks and as such it may be considered to have succeeded. The operations undertaken by the Anzac corps developed into the most desperate struggle which had so far taken place in Gallipoli. The Australians began the attack against the Lone Pine Plateau in the afternoon of the 6th, and before night the whole Lone Pine position had been won. For the next few days the Australians had to fight to maintain their ground, and in this action alone the Turkish losses were estimated at 5000 men. The effect of the action was auspicious, for it drew all the local reserves to meet it. Meantime the Anzac left wing began to move during the night of the 6th, and the preparatory movements were tolerably successful. The principal operation began at dawn on the 7th. At first the New Zealanders made good progress and carried Rhododendron Ridge to the W. of Sari Bair, but the Indian and Australian troops on their left were held up in the difficult country. At dawn on the 8th the New Zealanders again attacked and carried the crest of Chunuk Bair from which they could just see the Dardanelles. On the 10th the Turks counter-attacked on Chunuk Bair and drove the Brit. forces some distance from the ridge, but were there held. The landing at Suvla Bay had taken place on the 7th with the support of monitors in the bay, but little advance was made, and by the 9th it was too late, for the Turks had already moved reinforcements to the area. For the next ten days no further advance took place, and the Brit. prepared for a new landing at Suvla, for which the 29th Div. was transported in trawlers from Cape Helles. The attack began on the 21st, but it failed. The Aug. fighting was the most costly part of the Dardanelles campaign. For the first three weeks of the month the Brit. casualties were approximately 40,000, and the sole result was to extend the length of the Brit. battle-front by 6

m. and to advance it on the left by a m. or two. After the end of Aug. the two exhausted armies abandoned further hope of advance. (See GALLIOLI CAMPAIGN.)

*Allied Diplomacy and the Balkan States.*—During the spring and summer Allied diplomacy had been concentrating on the complicated problem presented by the Balkan States. Ferdinand, king of Bulgaria, demanded as the price of Bulgaria's assistance to either side the return to her of her ter, which had been seized by the other Balkan states. As the Allies could satisfy Bulgarian demands only at the expense of the Serbs, who were already their allies, and the Rumanians and Gks., whom they hoped to make their allies, their promises were but half-hearted. Germany, however, offered Bulgaria Serbian Macedonia, Salonika, and also the Epirus, Gk. ter, which had never before been mentioned in Bulgarian claims. This offer was finally embodied in a secret treaty signed on July 17, 1915, between Bulgaria, Germany, Austria, and Turkey. The Gers. now undertook a campaign to secure the Balkans and bring in the waverers on their side. Bulgaria being now secretly committed to them, they could hope to control the railway to Constantinople by a successful Balkan campaign, and so bring much needed munitions to Turkey and food and other supplies to Germany. Ger. diplomacy appreciated, too, that Brit. fears for India and Egypt would be increased by a Ger. success in the Balkans and that these fears might induce the Brit. to divert to the Balkans troops needed on the W. front. Mackensen, the victor in Galicia, was selected to lead the Balkan campaign, and during Aug. the concentration of troops began. On Sept. 19 Mackensen's combined Ger. and Austrian forces opened fire on Belgrade. At first he made little progress. The Entente continued up to the last possible moment to play for Bulgarian neutrality, and even refused to allow Serbia to undertake an aggressive movement against Bulgaria which might have altered the course of events. Venizelos (q.v.), the Gk. Prime Minister, was not deceived, and on Sept. 21, after the Ger. attack on Serbia had begun, he asked France and Britain to send 150,000 troops to Salonika.

*Allied Expedition to Salonika and German Invasion of Serbia.*—That day the first steps for Bulgaria's mobilisation were taken, although the official order was dated two days later. On the 24th France and Britain agreed to Venizelos' request to send a force to Salonika, and on the same day Greece began to mobilise. On the 25th news came that Bulgarian cavalry was massing on the Serbian frontier. Rumania, already mobilised, announced that she would as yet take no decisive step. On Sept. 28, Veni-

*A map of Gallipoli and the Dardanelles is printed in the article*

zelos secured the support of the Opposition in the Gk. Parliament to his War Credits Bill, and on Oct. 5 Russia broke off relations with Bulgaria, to be followed by Britain and France. Meanwhile the Allied troops were arriving at Salonika. On Oct. 4, Venizelos had announced that Greece must go to war without waiting for a formal declaration by the Central Powers; but the next morning King Constantine told him that his policy had not the royal sanction and he resigned. Zaimis became Premier, and announced that Greece would retain an armed neutrality benevolent towards the Entente. Mackensen now moved swiftly. On Oct. 9 Belgrade was captured. On the 11th Bulgarian troops crossed the Serbian frontier, and on the 12th, Bulgaria declared war on Serbia. On the 15th Britain declared war on Bulgaria. The Allies had only some 13,000 troops at Salonika, and there was no hope of Rumania coming in on the Allied side unless Russia could make a diversion in Bessarabia. The troops at Salonika could hope to do little more than harass the flank of the Bulgarian advance into Serbia. Serbia faced the new invasion with an army reduced by the losses of 1914 to not more than 200,000. Her internal condition was completely disorganised by repeated invasions, but if Mackensen had been the only enemy they could have hoped to retire again to the hills and keep in touch with the Allied base at Salonika. The intervention of Bulgaria on the eastern flank completely altered the situation. The only hope for Serbia was that the Allies at Salonika might be able to turn the Bulgarian flank (see *SERBIA, History*); but the Allies were unable to advance, and the Serbians had to fall back after a week to the Albanian borders. Gen. Sarrail, with the Fr. force which had landed first at Salonika, advanced up the railway line towards Mitrovitza as far as Krivolak, while the Brit. were on the Fr. right towards Lake Doiran. The Fr. succeeded in crossing the Vardar R. and occupying the heights opposite Krivolak, but were compelled to fall back from an advanced position across the Teberna into an entrenched camp they had prepared around Kavadar. The Allies had failed to bring help to Serbia while involving their own forces in extreme difficulty. After the capture of Nish, Mackensen, having secured the route to Constantinople, left the advance mainly to the Bulgarians, on whom he relied to complete the rout of the Serbian remnants who were now struggling through the passes to the Albanian coast. By Dec. 12 the Allies had withdrawn within the Gk. frontier, without serious losses, and took up a strong position about 30 m. from Salonika. Although the purpose of the Salonika landing had failed, the Allies were determined to hold it, because it would have made a formidable base if occupied by the Central Powers. Accordingly steps were taken to fortify the lines across the whole peninsula of Chalcidice. The Austrians had now

undertaken the conquest of the little kingdom of Montenegro. On Jan. 13, they entered Cetinje, the cap., and announced the unconditional surrender of Montenegro, but it was soon found that there had been no surrender and that the Montenegrin Army was retreating towards Scutari, while King Nicholas of Montenegro had fled to France. On Jan. 23 the Austrians occupied Scutari, and moved S. against an It. force at Durazzo, which they captured on Feb. 27, and the loss to the Allies of this port made it necessary to find some base for reitment inaccessible to the enemy. Fr. and It. troops were landed at Corfu, and the Serbian Army, evacuated from Durazzo, was able to use it as a rest camp.

*Evacuation of Gallipoli and its repercussion in Mesopotamia.*—Meanwhile the Gallipoli campaign (*q.v.*) had come to a standstill. The heavy losses during the seven months of the expedition, coupled with the doubt whether supplies by sea could be maintained in the winter storms, decided the Allies to undertake the difficult task of evacuating Gallipoli. The final embarkations from Suvla and Anzac took place on the nights of Dec. 18 and 19, and early on the morning of the 20th the last troops from these areas began to embark. The evacuation of Cape Helles was still more difficult and had to be delayed; but the last troops were evacuated on Jan. 8.

Their preoccupation with Gallipoli ended, the Turks were now free to turn their attention to other areas, one of which was Mesopotamia. A force from India had captured Basra at the junction of the Tigris and Euphrates in Nov. 1914. Early in Dec., the Turks collected troops at El Qurnah, 50 m. up the Tigris at the junction with the old channel of the Euphrates. A Brit. force accordingly advanced to that place, but had to wait for reinforcements before obtaining the surrender of the Turkish garrison on Dec. 9. The Brit. had now obtained control of the whole of the delta and prepared entrenched camps on either side of the Tigris, at El Qurnah and Mezera, to secure their position. At the beginning of 1915 further reinforcements were brought from India under Sir John Nixon, who took supreme command of the operations. During April the Turks attacked the Brit. positions in force, but were beaten off with heavy loss. Towards the end of May they attacked again and it was decided to drive them N. The important military post of Amara, 75 m. N. of El Qurnah, was captured on June 3, and the Brit. advance continued in spite of a desire to limit the operations, largely because each advance made necessary some further operation to secure the position reached. Thus the Brit. hold on Amara was precarious so long as they did not hold Nasiriyeh on the Euphrates. A Brit. force from El Qurnah made a difficult march through the floods and captured Nasiriyeh on July 25, with large stores of ammunition. By this time the larger project of an attack on Bagdad itself was being developed,



and an advance to Kut al Amara (*q.v.*) was decided upon. By the 29th the Turks were in retreat towards Bagdad and the Brit. under the command of Maj.-Gen. Townshend (*q.v.*), entered Kut. By the end of Sept. Townshend was only some 200 m. by riv. and 100 m. by land from Bagdad, with easy country before him and the winter climate which was favourable to campaigning. But he had little more than a div., he was well over 300 m. from his base on the sea, and had a difficult riv. full of shoals and banks as his sole means of communications. Townshend protested against the advance but was overruled. On Nov. 22 the Brit. troops reached the Turkish prepared position in Ctesiphon. The battle continued until the 21th, but the inadequate forces of the Brit. could not pierce the strong Turkish positions. Accordingly, at midnight on the 25th the Brit. began their retreat. On Dec. 3 the remnant of the Brit. force reached Kut al Amara, and the historic five-month-long siege of that tn. began. Four Turkish divs. lay around the tn., and on the 7th th. Turkish commander, Nur-od-Din, called upon the garrison to surrender. On Townshend's refusal he opened a heavy bombardment. Relief forces failed to make headway through the floods, and the garrison were weakened by starvation and disease. On April 29 Gen. Townshend surrendered. The campaign had ended in disaster; but it had served a useful purpose in holding Turkish troops who would otherwise have been available in the Caucasus.

*The Russian Campaign in the Caucasus.*—The Grand Duke Nicholas, who commanded in the Caucasus, had been preparing for an offensive for some time. The immediate commander of the attacking forces, Gen. Yudenitch, began his advance on a wide front to avoid having his flank turned by the considerable Turkish forces which stretched northwards from Lake Van to the Black Sea. He planned to attack Erzerum by three columns converging on the city. The preparations for the advance were entirely unknown to the Turks, and on Jan. 11 Yudenitch's right wing drove back the enemy upon Lake Tortum, and then moved over the mt. passes and encircled the Turkish left, so that it was compelled to fall back towards Erzerum to avoid being cut off. His left followed similar tactics and the centre made good progress to the vil. of Kuprikei, which commands the bridge over the R. Araxes. Here a fierce battle took place from Jan. 16 to 18 when the Russians forced the bridge in a snowstorm and took the vil., driving the Turks back on the road to Erzerum. On Jan. 19, Yudenitch reached the strong Turkish position of Hassan Kaleh, which it was believed would be held in force; but the Turks had suffered so severely at Kuprikei that they fought only a rearguard action, and again retreated behind the Deve Boyun hills, which formed the immediate defence of Erzerum on the E. On Feb. 10 the right column coming down the valley of the W. Euphrates

through deep snow and some fifty degrees of frost reached the fort of Kara Gubek, at the extreme N.E. point of the defences of Erzerum. This fort fell on the 12th, and next day the Russians carried Fort Tafta, some 5 m. further along the valley, which gave them a position in the rear of the main defences on Deve Boyun, which they continued to attack frontally. Meanwhile the S. Russian column was forcing its way through the passes of the Palantun range to the S.E. of the city, and by the evening of the 15th they had carried the position, and on the 16th entered Erzerum. They captured some thirteen thousand Turks, over three hundred guns, and large stores of ammunition and war material. In the whole of the Russian advance some five Turkish divisions were completely destroyed. But the capture of Erzerum itself was not of great value without that of Trebizond and of Erzingan, which stood at the opening into the rich plain of Anatolia, from which Turkey drew her main supplies of food. The Turkish troops released from Gallipoli were coming up before Yudenitch could advance much further, and it was necessary to continue the advance with some caution. On the morning of the 18th March, Trebizond fell, the garrison retreating southward in the direction of Baiburt. On 25th July, Russian cavalry occupied Erzingan. Further advance was delayed for a time by Turkish attacks, but by Aug. 25 Yudenitch had broken these and was once again free to resume his slow progress towards Anatolia. (*See also under CAUCASUS.*)

*The Arab Revolt.*—Meanwhile in Persia during the spring and summer the Russians had been conducting a campaign with a small force under Gen. Baratov, which had been sent in Dec. 1915 to counteract the effects of Ger. propaganda there. The Persian gendarmerie under Swedish officers had been encouraged by Prince Reuss, the Ger. minister to Teheran, to rebel against the pro-Entente gov. Prince Reuss collected a total force of some 15,000 and endeavoured to hold certain important points at Kum, a telegraph junction on the road to Ispahan, and at Hamadan on the Bagdad road. Swiftly the Russians attacked these positions and drove the rebels to the hills on the border of Mesopotamia, where they kept in touch with the Turkish Army. In March Sir Percy Sykes arrived at Bundar Abbas and proceeded to organise a military police for S. Persia. Baratov continued to advance and reached the frontier of Mesopotamia in May; but in June Turkish reinforcements attacked him and drove him back finally even from Hamadan, while sporadic revolts began in Persia. Meanwhile, the revolt of the Arabs in the Hejaz (*q.v.*) considerably upset Turkish calculations. On June 9, 1916, the Sherif of Mecca proclaimed Arab independence of Turkey and occupied Mecca and the port of Jeddah, capturing the Turkish garrisons, and laid siege to Medina, and, later, cut parts of the Hejaz railway to prevent the Turks sending reinforcements from the N. The

revolt spread rapidly. The Said Idrissi of Asir took the Red Sea port of Kufidiah. On July 27 Yambo, the port of Medina, was captured, while the revolt spread northwards as far as Damascus. The Turks hurried reinforcements, and the Sherif had no easy task, but his Army made up in fanatical fury what they lacked in equipment. The revolt in the Hejaz delayed the development of the Turks' projected attack on Egypt; but in Aug. they advanced with a force of some 18,000 men towards the Suez Canal from the E. The Brit. forces were drawn up near Romani, about 23 m. E. of the canal. The Turks attacked on Aug. 3, and the fighting lasted throughout the 4th. The Brit. cavalry slowly withdrew, entangling the Turks in the sand dunes, and in the afternoon Brit. reinforcements came up, and the Brit. counter-attack completely routed the Turks who were pursued until the 9th, when they attempted a stand, but were again routed. It was a decisive defeat, which secured Egypt from further attack.

*The Policy of King Constantine.*—Meanwhile the situation of the Allied troops at Salonika had been considerably affected by the mutations of Gk. policy. The Gk. Army was impressed with the Prussian model of efficiency, and the Gk. general staff had little confidence in an ultimate Allied victory. There was also a good deal of apprehension in Greece concerning the possibility of Russia occupying Constantinople. Thus, after the fall of Venizelos in Oct. 1915, a temporising policy under the king's influence was adopted by the bureaucracy which carried on the gov. The Allies' report was to proclaim a restriction of supplies of coal to Greece and to Gk. ships in Allied ports, with the object of preventing supplies reaching the enemy. The front at Salonika was now held by the Brit. on the right, the Fr. in the centre, and the reconstituted Serbian Army on the left. An Allied offensive was planned for Aug., partly in the hope of taking Monastir, which had great political importance as one of the main objectives of the Bulgarian war policy, while a further motive for the offensive was to be found in the attitude of Rumania, which was already committed in secret to the Entente. If the Allies could hold a large Bulgarian force on the Salonika front, they would prevent Bulgaria attacking the Rumanian flank. Early in Aug. Gen. Sarrail was put in command of the whole of the Allied forces on the Salonika front. On Aug. 10 the Fr. began to bombard the tn. of Doran, close to the junction of the Gk., Bulgarian, and Serbian frontiers. On the 11th, they occupied Doran station and a height to the S. of the tn., and carried Doldjeli; but on Aug. 17 the Bulgarians began a counter-offensive. Their prin. advance took place beyond the extreme right of the Allied line on Kavalla, which neighbourhood was held only by Gk. troops, who were without instructions.

*Rumania's Entry into the War.*—Just at this critical period, Rumania entered

the war on the side of the Entente. For two years Rumania had preserved a cautious neutrality, because her strategic position was exceptionally difficult, owing to its great importance to all her powerful neighbours. But, with the Russian advance in the Bukovina in June 1916 (which will be considered in another section) and the Allied advance in the W., the position seemed favourable for Rumania to enter the war on the Allied side. On Aug. 27 Rumania declared war on Austria. She hoped to limit her participation to war with Austria, but the Allies recognised that this would be impossible, and on Aug. 28 Germany declared war on Rumania. On Sept. 1, Bulgaria also declared war. Rumania brought an addition to the Allied sources of some half a million men, but her value to the Allies was lessened by the fact that her main purpose in entering the war was to secure Transylvania.

*Rumania's Campaign in Transylvania.*—Rumania's first step was to invade Transylvania on Aug. 28 at numerous points. She gambled on the help of the Russian campaign in the Carpathians to distract the Austrian effort against her, and also on the advance of Sarrail from Salonika to distract the Bulgarians from her southern frontier. At first all went well with the Rumanians, and within a fortnight of the declaration of war all the passes, the strategic frontier railway, and most of the frontier tns. had been occupied, and the Magyar people of south-eastern Transylvania were in full flight. But the appearance of success was deceptive. The Rumanian forces were widely scattered, while the Austrians had fallen back on a shorter and safer line, and behind this line the Gers. were making preparations for a counter-attack on a scale entirely unsuspected by the Rumanians. Von Falkenhayn, formerly chief of the Ger. staff, had been sent to Austria to command the new Austrian Ninth Army, which was being prepared for driving back the Rumanian left wing into the Wallachian plains, and further S., von Mackensen was collecting another army which was to operate S. of the Danube and in the Dobrudja. The two armies were to converge on Bucharest.

*Mackensen's Campaign in Rumania.*—Mackensen advanced first into the Dobrudja, and on Sept. 6 captured Turtukal (important as commanding the ferry across the Danube to Oltenitza on the road to Bucharest), with a hundred guns and the whole of an infantry division. On the 9th Bulgarian troops occupied Silistria. Rumanian resistance in the passes proved unavailing, and by the second week in Oct. their Army was in full retreat, and von Falkenhayn's pressure was increasing. In the early autumn of 1916 the position of the Entente in the Near E. was not good, while Ger. plans in that area were nearer to realisation than they had been at any earlier period of the war. Ger. communication with Constantinople had been securely established, with the double result of securing supplies of food for Germany from Turkey and supplies of

munitions for Turkey from Germany, as well as stiffening the Turkish resistance. Russia was reaching the end of her resources.

**THE WESTERN FRONT IN 1916.**—*Résumé of the General Position at the Beginning of 1916.*—On the W. front, having obtained for her own use the great industrial areas of Belgium and N. France, Germany was accelerating output at the highest pressure, while successfully holding the front with fewer troops than the Allies required to oppose her. In other areas, Ger. successes, as shown above, had been immense. Not only was she producing munitions of war in overwhelming quantities, but the whole of her industrial life down to the smallest detail was mobilised for war. Being in a dominant position in relation to her allies, she had no need to fear the disagreements that commonly arise among equals, while she entertained the hope of advantage from possible differences among the Entente Powers. Britain was the most dangerous of her enemies on account of her wealth and her potential manpower; but there were signs that Britain was wasting her resources, and that her ministers had not yet grasped the needs of modern warfare.

*The Munitions Question in Great Britain.*—With the reconstruction of the Asquith ministry as a coalition in 1915, a Munitions Act was passed providing for gov. ownership in full control of munition factories so as to secure rapid production, even at the price of greatly enhanced wages. Meanwhile, gov. expenditure continued at a prodigious figure.

*The Recruiting Problem in Britain.*—Meanwhile, in the later months of 1915, the recruiting problem in Great Britain had caused anxiety. There was a growing opinion that the voluntary system operated both wastefully and inequitably. In Aug. 1915 a national register had been taken, which provided information of the man-power available, and from this it was obvious that some form of compulsory service would soon become necessary, unless the rate of voluntary enlistment could be increased. In this emergency the Earl of Derby (*q.v.*) was appointed director of recruiting. The main proposals of what was known as the 'Derby Scheme' were that men were to be recruited in forty-six groups, according to age, the married men filling the last twenty-three groups. These groups were to be called to the colours as occasion demanded. Local committees were appointed to exempt men who were considered essential to vital industries, and men enlisted under the scheme could afterwards claim exemption at special tribunals on various specified grounds. On Jan. 4, 1916, Lord Derby issued his report. It was then estimated that the total of men available for service would not be more than 830,000. On Jan. 5, Asquith introduced a Military Service Bill in the House of Commons, and the Bill passed rapidly through all stages in the House of Commons with a very small minority in opposition. (See CONSCRIPTION.)

*The German Attack on Verdun.*—With the object of a final reckoning with the still undefeated Fr. armies, the Gers. now prepared a new plan, of which Verdun (*see* VERDUN, BATTLE OF), the great fortress on the right of the Fr. line, was the objective. The Ger. plan was to attack at advantageous points all along the front so that the Allies would not know whether the attacks were feints or the beginning of a general offensive, and while their enemies were thus fully occupied the Gers. would be able to concentrate men and guns behind Verdun. Once the line was pierced there, fresh troops would be available for a final advance on Paris which should end the war. On the morning of Feb. 21, a short intense bombardment began. It was by far the fiercest bombardment yet experienced. It completely obliterated the first Fr. lines, broke up the communication trenches, and altered even the shapes of the hills. Close upon it the Ger. infantry moved forward to the attack, some fourteen divs. against the three Fr. territorial divs. who were holding the 7 m. of centre between Brabant and Herbebois. The Fr. fell back to their second line from which they could make a counter-attack under the fire of their 75's. A counter-attack regained some ground, but on Tuesday, the 22nd, a new bombardment was begun by the Gers., followed by fresh infantry assaults. The Fr. began a general retreat to prepared positions on the highest parts of the plateau, stretching from Vacherauville on the Meuse, along the Côte du Poivre (Pepper Hill), and S. to the gorge of Vaux at the edge of the hills. This position was the last defensive line covering Verdun. In a heavy snow-fall on the Friday morning the Gers. began their new attack. On the evening of the 25th, the Fr. front was pierced in the neighbourhood of the ruins of the old fort of Douaumont. But the victory was destined to be barren. At this juncture the defence was entrusted to Gen. Pétain. He stabilised the line and drove the Gers. from their position at Douaumont. The Ger. high command now realised that their frontal attack had failed. They therefore reverted to their more usual method when attacking a salient, of trying to drive in the two flanks.

The second phase of the battle of Verdun began with an attack from the N.W. on March 2, and the Fr. fell back behind the Goose's Crest. On the 8th the Gers. transferred their main effort to the front at Vaux, but it failed. On the 10th the Gers., heavily reinforced, again attacked; but the Fr. guns prevented them from coming to close quarters. On the 11th the Gers. made their supreme effort. The result of this attack on the W. bank of the Meuse was to win a triangle less than a m. deep between the Forges stream and the Béthincourt-Cumières road. The key to the position, Mort Homme, was still in Fr. hands. On the E. bank the Gers. had secured most of the Bois d'Hardaumont; but they had made no progress towards the

definitive capture of Douaumont. They now prepared a flank attack from the W.

On Friday the 16th the third phase of the battle commenced, when Ger. guns opened a bombardment of the lines between Avocourt and Béthincourt, and on the 20th, the first attack was made on the line between Avocourt and Malancourt, and by evening the Gers. were on the edge of the hill slopes towards Mort Homme. On the 28th they attacked Malancourt with innumerable waves of troops. But Pétain successfully counter-attacked and withdrew his troops from Haucourt to a position on the slopes of the hills. Fierce fighting continued until April 11th; but the Gers. failed to achieve any considerable success, and by the Tuesday it was clear that their main purpose had again failed. They had used some nine divisions in the attack, and had again suffered the heaviest casualties, out of all proportion to the Fr. losses, while they had secured not a single Fr. key position. Sporadic attacks continued; but the main plan was now abandoned.

Between May 3 and June 30 the second battle for Verdun was fought. It resulted in no permanent advantage for the Gers. who again sustained heavy losses. With the opening of the battle of the Somme, the attack on Verdun lost its vital importance, and the battle gradually relapsed into sporadic engagements.

**THE ITALIAN FRONT IN 1916.**—*Austrian Trentino Offensive.*—Throughout the winter of 1915-16, the Austrians had gradually been strengthening one section of the Trentino front between the Val Lagarina and the Val Sugana. In these valleys accordingly the Its. had made good defensive positions. A great bombardment began on May 14, when over 2000 guns, of which some 800 were of heavy calibre, destroyed the It. front line over a length of 30 m. In the centre, by June 1, the Austrians had driven back the Its. from many points on the last ridge of hills between them and the plain, and by the 14th had reached a point only 13 m. from Vicenza. But at last Cadorna's new Fifth Army began to make its presence felt and the Austrian advance was stayed.

*Italian Counter-offensive and capture of Gorizia.*—On June 24 Cadorna began his counter-offensive, and between the Brenta R. and the Adige he won ground everywhere. (See *Isosno*.) From Aug. 1, the It. guns bombarded the whole front from opposite Monte Santo to the Adriatic. On the 4th the Its. feinted from Montefalcone, with the object of drawing Austrian reserves to this part of the line preparatory to the real attack on Monte San Michele. On Aug. 6, the It. bombardment was resumed with great intensity in front of Gorizia; the Austrian front position was destroyed, and the It. Third Army under the Duke of Aosta began their advance. On the left, the Its. carried Monte Sabotino by storm, and before dark, reached a line within half a m. of the riv. On the right of this section the Its. stormed the strong position of Oslavia, and further S. they

advanced against Podgora; but this position was held with desperate bravery for two days by scattered Austrian detachments. The It. centre operating against the San Michele positions had made equally substantial gains. The Austrians here again offered a desperate resistance; but slowly the Its. forced their way to the key points, and by Tuesday, the 8th, Cadorna held all the heights on the W. bank of the riv. and the key point of San Michele on the E. bank. On the morning of the 9th the main It. Army crossed the riv. and entered Gorizia, while the cavalry pressed E.

*The Advance on Trieste.*—The It. offensive now entered on its second stage, which had for its objective the capture of the port of Trieste. The first move aimed at driving the Austrians from the Vallone. On Aug. 10 the advance began, and, by the 12th, the whole of the W. end of the Carso was in It. hands. Cadorna continued to press forward into the Carso and occupied the vil. of Oppacchiasella, the hill of Nad Logun, and positions on the W. side of Monte Pecinka. N.E. of Gorizia, the Its. took Tivoli and thus estab. for themselves a footing on the slopes of Santa Caterina. The way was now clear for Italy to declare war on Germany, which she did on Aug. 28, 1916. No movement E. of Gorizia could be successful unless the ridge of Monte Santo were won and the Carso carried, and each was a formidable operation requiring for success full concentration of troops. The next movement was undertaken in the Carso, when on the morning of Sept. 14 a great bombardment began between the Vipacco and the sea, followed on the same day by an It. advance. There was desperate fighting round Nova Vas, but no decisive gain—had been made by the 17th, and it was not until Oct. 10 that another attack was made. This was successful in straightening the front, and 5000 prisoners were taken. On the 12th the Its. carried the hill of Pecinka and reached the outskirts of the vils. of Lokvica and Hudi Log. On the 13th in bad weather a further advance was made to the Gorizia-Prvacina road; but a succession of great gales dislocated the advance, and finally compelled the Its. to withdraw to a line a little behind Pecinka, Lokvica, and Hudi Log. For a fortnight heavy rains continued, and the first cold of winter began to be felt. On Oct. 30 an intense bombardment started, the greatest yet employed in the Carso, and on the morning of the 31st the Its. again advanced with considerable success. On a front of more than 2 m. between the N. edge of the Carso and the Oppacchiasella-Castagnavizza road the Austrian line was shattered, numerous batteries were captured together with 5000 prisoners; but the advance had created a considerable salient, and on Nov. 2 the Austrian batteries shelled the new It. positions with appreciable effect. An infantry attack followed on the next day, but it failed and the Its. again advanced taking another hill and the crowning position on Fajti Irib,

which commanded the vil. of Castagnavizza and also the road across the plateau. Advance towards the S. was still blocked for the Its. by the formidable defensive system of Hermada, a great hill full of concealed batteries which covered the road to Trieste. To take this position meant a great concentration of guns, but meantime winter came on, and, although all through Dec. Cadorna waited for open weather, it did not come, and by Christmas he was compelled to postpone further advance until the spring.

**THE RUSSIAN FRONT IN 1916.**—*Russian Advance on Pripet-Pruth Line.*—By the beginning of Dec. the situation in the Balkans made it necessary for Russia to undertake some stroke which would divert a possible drive by the Central Powers into Bessarabia. Ivanov (*q.v.*) planned to attack Cernaui in order to cover the Rumanian border and began his advance on Dec. 24, but before he could attain his object heavy snow began to fall and the movement came to a standstill in the middle of Jan. It had, however, been useful to the Allies in bringing Mackensen N. to meet it and so reducing the pressure in the Balkans.

When it became clear that Italy might be overwhelmed if the Trentino attack succeeded, Russia arranged for a preliminary movement to relieve this pressure. On June 3 the Russians under Brusilov opened a bombardment along the whole front between the Pripet and the Pruth, and on the 4th the Russian advance began. By June 6 Gen. Kaledin (*q.v.*) was at the gates of Lutsk (*q.v.*), the headquarters of the Austrian Army commander, and the Archduke Joseph Ferdinand was compelled to withdraw. By June 16, Kaledin had advanced some 50 m., had captured Lutsk (Luck) and Dubno, had reached the Galician frontier, and was within 25 m. of Kovel. He had taken some 70,000 prisoners, 53 guns, and great quantities of war material. But after this date, formidable Ger. and Austrian reinforcements began to arrive. Ludendorff himself was sent by Hindenburg to restore the position, and four Ger. divs. were rushed from France in as many days. Kovel was the danger-point, for its loss would cut communications between the Ger. Army of the centre and the Army of the S. Von Linsingen, who had been brought to the Volhynian front, opened his counter-offensive on June 16, but he did not receive the reinforcements he expected owing to the Russians having attacked on the centre N. of Baranovitchi, a nodal point on the Ger. railway system between Vilna and Brest-Litovsk. Meanwhile, in the S., the Russians under Lechitsky had made another effective advance. By June 13, after nine days' fighting, they had taken 38,000 prisoners and 49 guns, and on the 17th entered Cernaui.

*Austrian Retreat to the Carpathians.*—The Austrians were in full flight towards the Carpathians. By the 23rd the Russians had taken Kimpolung, the most S. tn. in the prov., and the whole of the Bukovina was once more in their hands.

Early in July the Russian Gen. Lesch carried out another effective advance which secured the right flank of the Volhynian salient, and took him to the banks of the Stokhod R. with 12,000 prisoners and 45 guns among his captures. Kovel was now only some 20 m. distant, but the intervening ground was difficult, and it was obvious that von Linsingen would employ every man he could to defend so important a position. Brusilov discovered von Linsingen's plans for a counter-offensive on the S. of the Russian salient, and anticipated it by sending Sakharov to advance towards Brody. He reached and took the tn. on July 28, taking in this movement some 13,000 prisoners. But Sakharov did not rest and by Aug. 10 he had completely turned the flank of the opposing troops. Meanwhile Lesch and Kaledin had made further attacks and won the whole line of the Stokhod R. Lechitsky in the S. also continued to make rapid progress, and, by the end of June, he had seized the important railway centre of Kolomea. Heavy rain delayed his further advance, but on Aug. 10 his right wing occupied Stanislaw. The extraordinarily rapid series of Russian successes led to a complete reorganisation of the Central Powers' commands. Most of the Austrians were replaced by Gers.

**IRISH REBELLION—BATTLE OF JUTLAND.**—*The British Military Service Act.*—In Britain, the Military Service Act was giving rise to some difficulty on account of the exemptions from service granted to men in 'essential' occupations. Not until a considerable tightening up of the regulations was effected did the Act work smoothly, and for a time the calling up of married men had to be discontinued until the manifest injustices were remedied.

*The Irish Rebellion.*—What was potentially a greater danger to the Brit. campaign was the Easter Rebellion of 1916 in Ireland. On the outbreak of the war the truce between the Ulster and Nationalist leaders had not been accepted by the wilder spirits in S. Ireland, and Germany had made unceasing efforts to stir up revolt among the more extreme Nationalists, and particularly among the members of the Sinn Fein (*q.v.*) organisation. Of these were formed the Irish Volunteers, whom the gov. at Dublin Castle did little to suppress. Sir Roger Casement (*q.v.*), had identified himself with this movement, and during the war went to Germany with the object of enlisting readily promised Ger. support for an armed rebellion, but the promises were never kept, and it is obvious that they had been made only in the hope of embarrassing Britain. An attempt to raise an Irish brigade from prisoners taken by the Gers. failed miserably; Casement and two companions were landed on the Irish coast from a Ger. submarine. The Sinn Feiners failed to meet them, and Casement was arrested on Good Friday morning, the 21st, and taken to England. His capture upset the plans of the other rebel leaders; but it was decided that the rebellion must continue, and on Easter

Monday, the 24th, the rebels seized St. Stephen's Green, the law courts, the post office and part of Sackville Street. Troops were brought from the Curragh, and reinforcements were sent from England. By May 1 the revolt had been crushed in Dublin and the local revolts were dying down. Fifteen of the leaders were tried by court-martial and shot. Casement was tried for high treason and executed.

**Battle of Jutland.**—In the early morning of May 31, the Ger. fleet put to sea, and the Brit. Grand Fleet set out to meet them. Chance brought the Ger. battle-cruisers under Adm. von Hipper into contact with Vice-Adm. Beatty's combined fleet of battle-cruisers and fast battleships at about 2.00 in the afternoon off the coast of Jutland, when Adm. Jellicoe, the Brit. commander-in-chief, with the main fleet, was scouting some distance to the N. At about a quarter to four the action began at long range. In spite of his advantage in numbers, Beatty suffered the first and also the most serious losses in this part of the battle. The Ger. battleships under von Scheer appeared at about 4.30; and Beatty turned N. to join Jellicoe. Contact was made soon after 5.30, and Jellicoe's ships came into the fight soon after. Again, in spite of severe damage to the Ger. force, Brit. losses were the heavier. Soon after 7.0 p.m., the Ger. High Sea Fleet received orders to turn away individually, and by nine o'clock the firing ceased with the complete disappearance of the Gers. in the mist. Thus ended, inconclusively, the one great naval action of the war. In its ultimate effects the battle was more nearly a victory for the Allies, since it confined the Ger. fleet to port for many months for repairs. (See also JUTLAND, BATTLE OF.)

**Death of Lord Kitchener.**—Soon after the battle of Jutland Lord Kitchener, who was on his way to Russia to confer on the coming Allied offensive, lost his life at sea. (See KITCHENER, VISCOUNT.)

**THE WESTERN FRONT, JULY-NOVEMBER, 1916.**—*Sir Douglas Haig appointed British commander-in-chief.*—Meanwhile Germany maintained a conciliatory attitude towards the U.S.A., largely owing to the temporarily enhanced influence of Bethmann-Hollweg and his 'politicals.' On the W. front the Brit. had taken over since the beginning of the year a considerable part of the line from the Fr., at the same time as Sir John French had been recalled and replaced by one of his former corps commanders, Sir Douglas Haig.

**Allied Military Conference—Allied Economic Conference.**—The first general Allied military conference took place in Paris in May, and there, for the first time in the war, was prepared a common plan of campaign. At an Allied economic conference in Paris in June it was resolved to co-ordinate the Allied economic systems, to prohibit their subjects from trading with the enemy directly or indirectly, and to prohibit the export to neutral countries of certain articles which might be re-exported to enemy countries.

Further engagements were entered into for the period of reconstruction after the war, and certain permanent agreements for preferential treatment between the Allies were made, with a number of restrictions on the trading activities of enemy countries after the war.

**The Battle of the Somme (1916).**—The plan for an offensive on the W. front involved a joint advance by Brit. and Fr., at the point on the Somme where their lines joined. The attack was to be made on a front of 25 m. from Gommecourt, half-way between Albert and Arras, to Fay, 5 m. N. of Chauhnes. The object of the offensive was to drive the Gers. N. towards the coast, and so make it impossible for them to continue to hold the S. part of the great salient. But the Gers. had not been idle during the winter, and they had made, in the Bapaume ridge, vast underground chambers, which no artillery could destroy, and these were to be mainly responsible for the failure of the Allied offensive to achieve its object. The battle of the Somme began on July 1, after a preliminary bombardment since June 24. The attack by the Brit. part of the line had been anticipated by the Gers., and in the N. part little progress was made; but further S. Mametz and Montauban were taken on the first day. The Fr. S. of the Somme made progress, reaching Baches 1 m. from Péronne on the 9th. On July 14, the second stage of the battle opened with a Brit. attack from Contalmaison to Trônes Wood. A successful advance was made, the Gers. being driven out of Bazentin-le-Grand and -le-Petit and out of Trônes Wood. At the same time, a great advance was made to High Wood (Bois des Fourreaux) and the Gers. were driven out of most of Longueval and Delville Wood; but much of this ground could not be held, and it took many days to secure sev. of the points reached on this day. The Australians captured Pozieres on July 26. During Aug. the Fr. improved their position N. of the riv. Sept. showed better results for the Allies. On the 3rd, in a general attack, Guillemont was carried, and the Fr. carried by storm Le Forest, Cléry, and the Ger. lines up to the outskirts of Combles. On the 5th the Brit. entered Leuze wood between Guillemont and Combles. The Fr. continued to advance both N. and S. of the Somme, and on the 9th Ginchy was captured by the Irish regiments which had taken part in the capture of Guillemont. Thus at last the Allies were beginning to move; but it had taken over two months to secure points intended to have been taken in the first few days of the battle, and at the price of appalling casualties. The third stage of the battle, in the Ancre area, opened with a preliminary attack by a brigade of Gough's Fifth Army on Sept. 14, which stormed the Hohenzollern trench and a strong redoubt (see HOHENZOLLERN REDOUBT), and diverted attention from the real attack on the 15th. In this attack, for the first time the Brit. made use of tanks, which spread devastation in the Ger.

lines. But the advantage derived was not followed up owing to the failure of the Brit. home staff to realise the usefulness of the new weapon. During Oct. and the first half of Nov. more costly but indecisive gains were made, including the capture of Thiepval by Gough's army and that of Combles through Fr. and Brit. movements. Bad weather then set in, and the Gers. who had already begun to prepare what became known as the famous Hindenburg Line (*q.v.*), far in the rear, were enabled to cling to the Bapaume salient until such time as they should carry out an orderly retreat. Early in Nov. the Brit. captured the strongly fortified position of Beaumont-Hamel (*q.v.*), and later in the month they made further advances, but the oncoming winter postponed any further progress. The Brit. casualties in the five months' fighting were nearly 500,000. (*See under SOMME BATTLES*; *ANGRE, BATTLE OF THE*.)

**French Attack at Verdun.**—On Oct. 24 the Fr. made another attack at Verdun. Gen. Nivelle (*q.v.*) entrusted the attack to Gen. Mangin (*q.v.*), who by the vigour of his attack took the Gers. by surprise and, from Fleury to Fort Douaumont, positions which had taken the Gers. months to win were recovered in a few hours. On the Fr. right progress was slower, but on Nov. 2 and 3 first Fort Vaux and then the vils. of Vaux and Damloup were recaptured. On Dec. 15 the Fr. gained still greater successes, capturing Vacheranville, Poivre Hill, Haudromont Wood, and Louvemont on the left, Chambrettes Farm and Caumères Wood in the centre, and Hardaumont Wood and Bezonvaux on the right. To the N.E., the Gers. had been driven back almost to the positions from which they started in Feb., although to the N. they still retained some of their gains, and the Fr. counter-offensive did not extend W. of the Meuse.

**THE COLLAPSE OF RUMANIA.**—The retreating Rumanians offered strong resistance to von Falkenhayn in Transylvania, and his efforts to advance in the central Carpathian passes towards Bucharest during Oct. were defeated. He was no more successful against Moldavia, and, when Nov. arrived with the likelihood of snow blocking the passes, he had advanced no more than some 4 m. into Rumanian ter. But by Oct. 20 Mackensen who had received reinforcements, broke the Russo-Rumanian line, and, on the 21st, cut the railway between Constanta and the bridge over the Danube at Tchernavoda. Constanta was abandoned on the 22nd, its stores of oil and wheat being burned, and on the 25th a span of the Tchernavoda bridge was blown up by the retreating Rumanians, while the Russians hastily withdrew 35 m. to Babatag. Here, on Nov. 1, Sakharov arrived to assume the command with sev. new divs., and a counter-offensive began—but too late, for the Rumanian defence was collapsing in the W. salient. Von Falkenhayn had now transferred his main attack to the Vulcan Pass, still further to the W., and with fresh reinforce-

ments the Gers. continued their advance, and, by Nov. 21, entered Craiova on the main Rumanian railway, thus isolating the W. Rumanian armies. On Nov. 23, Mackensen forced the passage of the Danube between Samovits and Sistovo, and by the 27th he had effected a junction with von Falkenhayn, whose Army had now swung E. across the Aluta and was making an advance on Bucharest, which fell on Dec. 5, and for the rest of the year the Gers. continued their brilliant progress E. until the Russo-Rumanian forces found a line where they could make a stand—a line formed by the Danube, the Sereth, and the Putna, ascending to the Oitos Pass. Sakharov had been forced to withdraw from the Dobrudja, and all that was left of Rumania was its Moldavian prov., less than one-third of the kingdom. The Rumanian court and gov. estab. its temporary cap. at Jassy, near the Russian frontier.

**Allied Advance into Serbia.**—Sarrail's campaign in the S. provided inadequate compensation for the Rumanian disaster (*see SARRAIL*). The Brit. were confined on the Salonika front to isolated raids which did not result in any permanent gains. The serious offensive undertaken by Sarrail was towards Monastir, and the Serbian Army played the prin. part in it. The Bulgarian offensive from Monastir in Aug. had penetrated a long way within the Gk. frontiers, and threatened to turn Sarrail's flank by an advance to the Gulf of Salonika when Sarrail began his own attack on Sept. 7. The first serious fighting took place to the W. of Lake Ostrovo, where, on the 11th, the Serbs, captured Ekshim. On the 20th they stormed Mt. Kaymakchalan and recovered a footing on their own ter. On the 29th the Serbian general Mshitch descended the mts. towards the bend of the Tchernia R., and by turning the flank of the Bulgar-Ger. Army, forced it back beyond the Gk. frontier. By Nov. 15, although delayed by bad weather, Mshitch had mastered the river-bend and thus outflanked the enemy's left, so that they were compelled to retreat from Kenali to Bistritza, 4 m. from Monastir, when the Fr. and Russians again attacked. By the 19th the Serbs were threatening the line of retreat from Monastir to Prilep, and accordingly on that day the Bulgars evacuated Monastir. The Allied position was further improved towards the end of the year; but Monastir marked the limit of their advance, and was continually subject to bombardment for another two years. Sarrail's campaign had failed to effect a diversion in favour of Rumania; but it had secured Greece from Bulgarian attack.

**LYDD GEORGE AS PRIME MINISTER.**—**Criticism of the Government.**—In Great Britain towards the end of the year there was increasing irritation over the conduct of the war. The halt on the Somme, the collapse of Rumania, and the failure of Sarrail were all laid at the door of the Brit. foreign office and war office. The rise in the price of food and the apparent failure of the gov. to undertake the neces-

sary methods of controlling supplies gave rise to the fear of famine. It was also felt that the Brit. air organisation was faulty, although the autumn had seen remarkable successes by the Brit. aeroplanes against Zeppelin raiders over Britain. The admiralty was criticised in conjunction with the renewed Ger. submarine campaign and raids on the Channel flotilla. Lloyd George became Prime Minister on Dec. 7, and incorporated in his Cabinet a number of business-men who were to undertake the expert control of various depts.

In France Gen. Nivelle succeeded Joffre as commander-in-chief on the W. front. In Austria the Premier was murdered in Oct. and his successor compelled to resign in Dec. At the end of Nov. the Archduke Charles succeeded his great-uncle as emperor of Austria. He was able to give no more security to his ministers. In Germany Bethmann-Hollweg's tenure of office was ending permanently; while in Russia a great disaster was dawning.

**THE GERMAN PEACE NOTE.**—*Political Situation in Russia.*—When the Duma met on Nov. 14, the reactionary gov. of Stürmer was fiercely attacked, and Miliukov, the leader of the Cadet Party, accused the Premier of corruption and intrigue with Germany. Stürmer resigned and was succeeded by Trepov, who had done good work as minister of communications; but he was handicapped by being compelled to retain Stürmer's prin. lieutenant, Protopopov, at the ministry of the interior. Germany now tried to enlist the inhabitants of the occupied ter. on the E. front in her support. On Nov. 5 she announced that, in conjunction with Austria, she proposed to estab. an independent Poland with a hereditary monarchy and a constitution. The proposal, obviously designed to secure Polish recruits and embarrass Russia, failed of its purpose, while it temporarily stiffened the resistance in Russia even of those elements inclined to show sympathy towards Germany. In Dec. Germany began her first attempt to manoeuvre the Allies into peace. She was becoming apprehensive of the future, with the Allied power growing to ever greater proportions. The Ger. chancellor announced in the Reichstag, on Dec. 12, that he had sent notes to the belligerent powers; the emphasis, necessary for the Gers., on the suggestion that Germany was now victorious in a war forced on her by her enemies, was less convincing to some of the neutrals. It was, moreover, an empty offer, for it specified no terms which Germany would be willing to accept, and these terms could only be deduced from the implicit arrogance of the general statement. On Dec. 30 the Fr. Gov. communicated to the U.S. ambassador in Paris a formal answer, signed by Russia, France, Great Britain, Japan, Italy, Serbia, Belgium, Montenegro, Portugal, and Rumania, in which they declared that there could be no peace until Germany offered reparation, restitution, and guarantees for the future.

**INTERVENTION OF THE U.S.A.—Effect**

*of the British Blockade on American Trade.*

—On the outbreak of the war, feeling in the U.S.A. on the part of a not inconsiderable element was sympathetic towards Germany. Moreover, the gov. of the U.S.A. was bound by the traditional Amer. policy of avoidance of entangling alliances, which dated from the time of Washington. The Monroe Doctrine embodied this policy, and at two Hague conferences America had reasserted it. Early in the course of the war, however, the U.S.A. began to realise that she was going to be seriously affected by the actions of the belligerents. The first difficulty arose over the Brit. maritime policy. At the outbreak of war, Great Britain had announced her intention to abide by the Declaration of London (q.v.), which contained provisions she soon found herself unable to abide by. Presently successive Brit. orders in council altered the Declaration of London beyond all recognition, and the altered conditions were found to interfere with Amer. shipping. America protested; but even thus early in the war the inept Ger. diplomacy in the U.S.A. to some extent counterbalanced ill-feeling against Britain.

In the early months of 1915, the new Ger. submarine policy in answer to the Brit. blockade aroused further ill-feeling against Germany, for Germany had warned the U.S.A. that neutral ships might be sunk during the submarine campaign. By the middle of 1915, the position of America was still more difficult. President Wilson's policy of neutrality was based upon a reasonable view of Amer. interests; but Germany seemed determined to make neutrality difficult, by such outrages as the sinking of the *Lusitania*, which drew a strong protest from the U.S. Gov. Germany emphasised the justice of the protest by her defiant reply, which led to a further exchange of notes, that presented by secretary of state Lansing, in the middle of July, being particularly stiffly worded. It laid down three principles: that the high seas are free to neutral ships; that this freedom can only be interfered with after the character and cargo of the ship have been ascertained, and that the lives of non-combatants can only be lawfully endangered if the vessel tries to escape after being called upon to stop or attempts resistance. The note further stated that a repetition of the breaches of these principles of which Germany had been guilty would be regarded as an unfriendly act. A few days later Ger. submarines sank an Amer. steamer off the Orkneys; but the U.S. Gov. still took no more decisive action, partly because her relations with Britain, in spite of much goodwill on both sides, were also reaching an *impasse* over the blockade of Germany declared by the Brit. Gov. in March 1915. The blockade laid down the new claim to seize and confiscate non-contraband goods of Ger. origin, ownership, or destination carried in neutral ships to neutral ports, and during the summer the U.S. Gov. addressed a series of strong protests to the Brit. Gov.



**President Wilson's Policy—Effect of German Submarine Campaign.—**The *Lusitania*.—Feeling in Great Britain at this period was becoming somewhat impatient with America, public opinion being unable to grasp the reasons for Amer. neutrality. During the summer of 1915, the Gers. continued to provide the U.S.A. with severe tests of their neutrality. The sinking of the *Lusitania* (q.v.) roused the Amer. people to a true understanding of what Ger. methods of maritime warfare might mean to them, and on Aug. 19, the sinking without warning off Cape Clear of the White Star liner *Arabic* increased their anger, for twenty-six Amers. were among the passengers on the vessel. A week later Count Bernstorff the Ger. ambas., informed Lansing that full satisfaction would be given to America for the sinking, and Herr von Jagow, the Ger. foreign secretary, announced that Germany had now adopted a new policy which would clear up the submarine difficulty. This policy consisted of a declaration that liners would not be sunk by submarines without warning and without ensuring the safety of non-combatants, provided that the liners did not try to escape or offer resistance. On Sept. 4 another liner, the *Hesperian*, was torpedoed without warning. There was small loss of life, but among the crew were two Amer. citizens.

**German Agents in America.**—Relationships were being still further strained by extraordinary revelations about the activities of Ger. agents in America. For a long time there had been rumours of secret activities of Ger. agents financed by the Ger. embassy in Washington. It was alleged that there had been deliberate falsification of passports, particularly by the Ger. naval and military attachés, Capt. Boy-Ed (q.v.) and Capt. von Papen (q.v.), and that dynamite outrages in Canada and various incendiary fires in U.S.A. factories had also been organised from Washington. During Aug. the *New York World* pub. information proving that Count Bernstorff had control of immense funds for propagandist purposes and that Ger. agents were fomenting strikes in Amer. munition works and urging the Imperial chancellor to prevent the dispatch of goods purchased in Germany by Amer. manufacturers so that the default might be attributed to the Brit. blockade. These interferences with Amer. internal affairs were brought to a head by the Dumba Case, made public early in Sept. On Aug. 30, the steamer *Rotterdam* touched at Falmouth, and the Brit. authorities seized a number of confidential papers and letters in the possession of an Amer. journalist called Archibald. Among the documents seized was one from Count Bernstorff on the subject of the highly compromising revelations which had been made by the *New York World*. In his memorandum, Count Bernstorff denied that Germany had tried to organise strikes or to 'take part in a plot against the economic peace' of America. Archibald's dossier also contained communications from Dr. Dumba, the

Austro-Hungarian ambas. in Washington, and from von Papen, which exposed the falseness of Bernstorff's case. One of Dumba's dispatches to the foreign minister at Vienna contained a full description of the efforts he had made to stir up unrest among munition workers. The U.S. Gov. was compelled to take action, and insisted on the recall of Dumba.

**American Note on Allies' Maritime Policy.**—President Wilson addressed a note of protest against the Allied maritime policy on Nov. 5. It was realised in Britain that such Brit. regulations as that making liable to capture enemy merchandise even in neutral ships was in conflict with previous international agreements, as also was the revised Brit. definition of contraband; but it was generally felt that the necessities of the case justified the action. The Amer. Note was founded strictly on the letter of existing international law, and indeed even purported to explain away conflicting decisions of the Amer. Supreme Court in the Civil war on the subject.

**Republican Party's Attitude.**—Up to the end of 1915 President Wilson represented the great body of Amer. opinion in his determination to keep out of any entanglement in the war; but from that time onward the opposing party in the U.S.A., headed by ex-President Theodore Roosevelt and Elihu Root, steadily gathered strength. Germany saw in the note of Nov. 5 hope of a breach between America and the Entente, and when, on Dec. 7, the President's message to Congress denounced Ger. intrigues in America and asked for legislation to deal with them, Germany hastened to repudiate the campaign carried on by her agents in America, and followed this with an offer of settlement of the differences over the sinking of the *Lusitania*. On Feb. 15 Wilson's Cabinet rejected the *Lusitania* proposals and refused to admit a new Ger. claim to torpedo armed merchant vessels without warning. Two Dutch liners were torpedoed without warning, and on March 24 a submarine sank the Channel steamer, *Sussex*, with a number of Amers. among the victims. On April 19, Wilson made a speech in Congress indicting the whole Ger. policy of submarine warfare, which had been embodied in a note to Germany dispatched on the previous day. He concluded with the declaration that 'unless the Imperial Gov. should now immediately declare and effect an abandonment of its present methods of warfare against passenger and freight vessels, the gov. can have no choice but to sever diplomatic relations with the gov. of the Ger. Empire altogether.' This ultimatum drew from the Ger. Gov. the reiterated plea of self-defence against the illegal conduct of Great Britain, but drew also the concession that such vessels should not be sunk without warning unless they attempted to escape or offered resistance.

**American Presidential Election.**—During the summer of 1916, the relations of America with the belligerents remained

quiescent largely because foreign affairs were overshadowed by the presidential election, in which Wilson was standing for his second term. Wilson was re-elected in Nov. During the autumn of 1916 Germany, as stated in a previous section, began to prepare the way for peace overtures. On Dec. 18, President Wilson himself issued a note which had been prepared before the Ger. peace overture was issued. He took the opportunity of stating the aims claimed by both Allies and Central Powers in the war and of asserting the expressed willingness of both sides to accept a League of Nations to avoid future wars. He then invited each side to set out in detail their views. The Allies accepted the president's statement of their aims and expressed their adherence to the ideal of a League of Nations. Germany issued various statements claiming that the Allies had now 'dropped the mask' and admitted their 'lust for conquest.' On Jan. 13, 1917, the Ger. Gov. announced that all sea traffic within certain areas adjoining Britain, France, and Italy, and in the E. Mediterranean would 'without further notice be prevented by all weapons.' This meant clearly that Ger. submarines would sink at sight all vessels found in these areas.

*Diplomatic Relations between U.S.A. and Germany Severed.—*Message to Congress.—On Feb. 3, the Ger. ambas. in Washington was handed his passports and the Amer. ambas. in Berlin was recalled. On the same day the President announced to both Houses of Congress the severance of diplomatic relations with Germany. On March 12 the U.S. Gov. issued an order for the arming of Amer. merchant vessels, and, quickly following this, Ger. submarines sank five Amer. vessels. On April 2, Wilson, at a special session of Congress asked for a declaration of war. The decision to declare war passed both Houses by April 6, on which date a state of war between America and Germany came into operation. The entry of the U.S.A. into the war was of great immediate value to the Allies, for although no considerable contingent of Amer. troops could be sent to Europe for many months, the whole of the immense industrial organisation and financial resources of the U.S.A. became immediately available for the Allied cause.

*Passing of Selective Service Act.*—On April 28 Congress passed a Selective Service Act, and in five months a million and a half men were in training camps. On June 25, 1917, the first contingent of Amer. troops landed in France. Maj.-Gen. Pershing (q.v.), was appointed Amer. commander-in-chief. Meantime, the Amer. navy had already begun to co-operate with the Brit. In May, a flotilla of Amer. destroyers arrived in Brit. waters under Vice-Adm. Sims, and took part in the protection of Atlantic shipping. But perhaps the most vital contribution made by the U.S.A. during 1917 was the building of new merchant vessels and war vessels to replace tonnage sunk by the Ger. submarine campaign. Since

the announcement on Jan. 31 by Germany of blockaded areas in all the waters round Britain, France, and Italy, and in the E. Mediterranean, the submarine campaign had been increasingly successful. During April, the Allies lost some 550,000 tons gross of shipping. After April the losses slowly decreased, and in July the gross tonnage lost was no greater than 320,000; but in the first seven months of the submarine campaign the Allied losses amounted to some four and a half million tons, equalling the total Allied losses from the beginning of the war to the opening of the campaign in Feb. 1917. Home production was increased when possible, so that imports from overseas might be reduced. Essential shipping was protected as far as possible by providing escorts and arranging convoys (the system by which vessels travelled in company under escort of warships), and submarines (or 'U-boats' as they were familiarly known), were attacked with vigour and success. From the beginning it was recognised that America must deal with the question of replacement. She would be unable to send her newly trained armies to France unless the necessary shipping were available for their transport and supply. But by the beginning of 1918 this problem was solved. The staff of the Amer. Army took nearly a year to produce any really formidable addition to the Allied forces on the W. front.

*THE BALKANS, 1916-17.—Revolt in Crete.*—In Greece the position was confused. At the end of Aug. 1916 the Bulgars had seized considerable ter., the Gk. garrisons being sent to Germany. This roused the Venizelist party, and a revolution broke out at Salonika on Aug. 30 under Col. Zimbrakakis, a Venizelist deputy. Regiments were enrolled for service against Bulgaria, and in Sept. a Gk. regiment was sent to the front. On Sept. 24 a sympathetic revolt broke out in Crete, Mytilene, and other Gk. islands, and Venizelos left Athens for Salonika, where he formed a provisional gov. of insurgent Gks. This gov., which was gradually recognised by the Allies at once declared war on Bulgaria. The mainland of Greece, S.W. of Salonika remained under Constantine's rule. The king's party formed leagues of reservists to oppose war, while the king continued to evade the demands of the Allies.

*Allied Landing at the Piræus.*—On Dec. 1, 1916, detachments of Allied troops landed at the Piræus were driven off with loss. Allied diplomacy played into Constantine's hands, for the councils of the Allies were divided. France and Britain were keenly Venizelist; but the tsar was lukewarm, and Italy feared the emergence of the greater Greece for which Venizelos was working. At the beginning of 1917 the gov. in Athens was, in appearance, in a more reasonable frame of mind. By the end of May Venizelos had 60,000 troops at his disposal. The attitude of the Allies towards Constantine stiffened.

*Albanian Independence Proclaimed.*—On the 3rd June Italy proclaimed the independence of Albania under her pro

tection, and on the 8th she occupied Janina, thereby cutting communications between Greece and the Central Powers. On the 10th Fr. and Brit. troops entered Thessaly, partly to safeguard the harvest, and partly to occupy certain strategic points like Volo and Larissa, Sarraïl having long suffered from the attacks of irregular bands of reservists in his rear. On the 11th Fr. troops seized the isthmus of Corinth, and that evening Jonnart, as Allied high commissioner, arrived at Athens, accompanied by Allied transports. In the name of the protecting Powers he demanded the abdication of King Constantine and the nomination of his successor, who was not to be the crown prince.

*Abdication of King Constantine of Greece.*—A crown council was summoned and King Constantine signed an act of abdication in favour of his second son, Prince Alexander. On the 12th Fr. troops were disembarked at the Piræus and the ex-king and his family left for Switzerland. The most influential of the pro-Ger. party were exiled. On the 14th the Allied blockade of Greece came to an end. On the 21st Jonnart concluded an agreement with Zaimis for convening under Venizelos the Chamber which had been elected in 1915 and illegally dissolved. Accordingly, on June 25 Zaimis resigned and Venizelos formed a cabinet.

*Russia Revolts.—The Beginning of the Revolution.*—Famine was now widespread in Russia, and the feeling among the Russian people against their continued participation in the war was fanned by the Russian Council of Labour ('Soviet'). Nicholas II, having abdicated, a provisional gov. was formed under Prince Lvov, the gov. being a coalition of Left and Centre party groups. Miliukov, the Russian foreign minister, in the spring of 1917, sent a note to the Allies affirming the determination of the Russian Gov. to pursue the war to a victorious end. Soon afterwards, a Coalition Gov. was formed with Alexander Kerensky (q.v.) as war minister. This gov. also proclaimed its adherence to the Allied cause, but the newly-formed All-Russia Congress of Soviets was determined to obtain the Allies' acquiescence in the 'principles of the Russian Democracy' as a basis of peace. Strenuous efforts were still being made by the Russian military leaders. Brusilov worked out the plans for an offensive in Galicia, with the object of outflanking Lemberg. The Russian attack began on July 1, and at first prospered. The Russians had made a considerable advance on the Galician front and had captured some 18,000 prisoners. By July 10 and 11 the important tns. of Halicz and Kalisch had fallen to Kornilov's Army. But this was the limit of the Russian success. Hampered not only by bad communications but by desertion and indiscipline, the Russians began to waver before the attacks of the reinforced enemy, and when floods were added to the Russian difficulties the rout began. On the 16th Kornilov was obliged to evacuate Kalisch and to retire all along his front. On that day disorder had broken out in the cap.

On the 19th the Austrian counter-attack had developed; one Russian regiment deserted its position and, before evening, the whole front was in chaos. From the 21st to the 23rd, the advance of the Austrians continued so rapidly that they retook Tarnopol and wiped out the whole of the Russian gains of 1916. By the end of July the Russian armies in the S. were driven back to the frontier of Russia, but Prince Leopold did not advance further. On Aug. 2 Brusilov was dismissed from the supreme command and his place was taken for a short time by Kornilov.

*Kerensky becomes Prime Minister.*—Kerensky had become Prime Minister in place of Prince Lvov; but his power was already weakening, and he was falling between the two opposing groups; these were the growing forces of Bolshevism and the more nationalist elements including the generals of the Army, who wished to carry on the war. Kerensky made an effort to secure union between the opposing elements, but without effect. Meanwhile the Gers. had taken Riga. Alexeev was sent to organise a hasty defence, and the Gers. waited for the coming collapse. Kerensky's vanity caused confusion and unrest among the gens. with the result that when he assumed the position of commander-in-chief and put himself at the head of the Petrograd troops, he played into the hands of the Bolsheviks. The more moderate members of Kerensky's Cabinet resigned. A new Council of Five took the place of the former gov. and towards the end of Oct. the Gers. had advanced further so as to threaten Riga. Trotsky had become president of the Petrograd Soviet, and the primary object of the Bolshevik régime was now to get Russia out of the war, and they continued the negotiations for peace with the Gers.

*Trotsky's Repudiation of the Allies.*—*Brest-Litovsk.*—Hostilities on the E. front ceased on Dec. 2, and fraternisation between the troops began. The Allied Powers formally protested and Trotsky made a fiery speech denouncing foreign interference. On the 3rd a Russian deputation arrived at the headquarters of Prince Leopold of Bavaria at Brest-Litovsk, and on the 5th a preliminary conference opened there under the presidency of Gen. Hoffman, Prince Leopold's chief of staff. The Russian delegates asked for the retirement of the Ger. detachments from the is. in the Gulf of Riga which they had occupied since the revolution, and for a promise that no Ger. forces would be sent from the E. to other fronts. They urged also an armistice on all fronts alike. The Gers. refused this request, but finally, on the 15th, a truce was agreed to on the E. front to last from Dec. 17 for twenty-eight days. The meeting at Brest-Litovsk to discuss terms of peace was formally opened on Dec. 22. Von Kuhlmann, the Ger. foreign secretary, and Count Czernin (q.v.) for Austria, were the principal representatives of the Central Powers. The Russians

proposed a peace without territorial annexations as payment of indemnities. On Christmas Day Count Czernin announced the readiness of the Central Powers to accept such a peace, provided that the Allies pledged themselves to these principles and agreed to join in the negotiations. The conference accordingly adjourned until Jan. 4, 1918, so as to give the Allies time to consider the proposals. On Dec. 28, an agreement was made allowing the resumption of normal diplomatic consular relations between Russia and the Central Powers. Meanwhile, the delegates of Germany and Austria had been preparing drafts for an eventual peace treaty with Russia. In the first draft they declared that as soon as the state of war was at an end and the Russian armies demobilised, the Central Powers would evacuate occupied Russian ter. In the second draft the qualification was introduced that the position of the border provs., was to be referred to a special commission, those provs., being Poland, the Ukraine, Finland, Lithuania, Courland, and part of Estonia, and Livonia.

*The Ukraine.*—The Ukraine was in a different position. Her inhab., the Little Russians, while they had agreed to accept autonomy under the Russian Provisional Gov., did not accept the Bolshevik régime; but they set up an independent republic establishing peasant proprietors in the land and with nationalist aims, to neither of which the Bolsheviks could agree. The new republic formed an alliance with Kaledin and the Cossacks, and also with Rumania and Bessarabia. This Ukraine Gov. occupied Odessa, and in the N. and N.E. around Kharkov and Rostov there were numerous engagements with the Bolshevik troops.

*Finland.—Asiatic Border Provinces.*—At the opening of the Brest-Litovsk conference the Ukraine was demanding representation as a sovereign state. Finland had received autonomy from the Russian Provisional Gov., but had continued to claim full independence, and Kerensky had dissolved the Finnish Diet just before his fall. The Finnish people had thereupon appointed an administration on their own account, which in Dec. decreed separation from Russia. The Bolsheviks had tolerated this declaration, but the Finnish leaders, being of the right and right centre, were exposed to the attacks of left-wing agitators sympathetic to the Bolshevik régime across the border. Strife between 'Red Guards' and 'White Guards' had begun. In the Caucasus and in many parts of Siberia various separatist movements were also in progress, so that everywhere round the border the tendency was towards separate nationalism rather than international Bolshevism.

*Separate Peace.*—On Jan. 4 the period expired within which the Allies were to accept or reject the peace offer. The Allies had made no reply to the proposal. On the 9th von Kuhlmann announced that since the Allies had made no response the offer to negotiate had lapsed, thus compelling the Bolsheviks to negotiate a

separate peace, which Trotsky agreed to do on the 10th. On the 11th, he agreed to the inclusion of a separate delegation from the Ukraine. On Jan. 12, he laid before the Central Powers the Bolshevik proposals for the evacuation and reconstruction of the Russian ter. now held by the Gers. The Gers. refused them, von Kuhlmann declaring that there could be no relinquishment till a general peace had been concluded. Germany was stiffening her terms as she already saw hope of peace with the Ukraine and with Rumania, which would give her access to the E., and she could then deal with the Bolsheviks at her leisure. On the 16th, in spite of Trotsky's protests, separate negotiations were begun between the Austro-Ger. delegates and the Ukrainians. On the 18th the conference was adjourned and Trotsky returned to Petrograd. On the 18th also the long-delayed Constituent Assembly was opened in Petrograd; but on the 19th it was dissolved by a body of Bolshevik troops. Trotsky, meanwhile, had sent an ultimatum to Rumania on Jan. 15, and another on the 26th to the Ukraine. On the 30th the Brest-Litovsk conference was resumed, and Trotsky made one more appeal against the separation of the Ukraine, and against the Ger. policy with regard to the border provs. Meanwhile Bolshevik troops had taken Kiev and put the Ukrainian Gov. to flight. The Ukraine thereupon turned for help to the Central Powers and on the 9th peace was agreed upon between the Ukraine and the Central Powers, and the Army of von Linsingen moved E. along the Pripiet to defend the Ukraine. Trotsky surrendered to superior force, and on Feb. 10 announced that the state of war with Austria and Germany was at an end. Von Kuhlmann decided that as the Bolsheviks refused further negotiations they must be compelled to agree to the Ger. terms. Von Kichhorn was ordered to advance against them. He took Reval, Dyvinsk, and Pskov and advanced within 150 m. of Petrograd, while von Linsingen relieved Kiev.

*German Ultimatum to the Bolsheviks.*—An ultimatum was presented to the Bolsheviks, demanding acceptance of the Ger. terms, which had now been greatly hardened, within forty-eight hours. Lenin declared for surrender, and on March 3 the Bolsheviks were forced into signing the Peace of Brest-Litovsk (q.v.). The Central Powers on March 5 had now also secured a treaty with Rumania, and on the 7th a treaty with Finland. The treaty with the Bolsheviks compelled Russia to evacuate Estonia and Latvia, the Ukraine, and Finland. The dists. of Ardahan, Kars, and Batum were to be handed over to the Turks. Briefly summarised, the results of the Bolshevik foreign policy were that it had lost for Russia a quarter of her total pop., a third of her manufacturing industries, a quarter of her arable land, and some three-quarters of her iron and coal production. For the remaining Allies the Peace of Brest-Litovsk might have the gravest results. Germany had not only disposed of the E. front,

but had secured access to large new supplies of oil, foodstuffs, and cotton, and had cleared the way to Central Asia, where she could do incalculable harm to the Allied cause, threaten India, and foment rebellion in Persia. For Rumania the Russian revolution had meant the defection of the Russian contingents. On Dec. 6 she had been compelled to join in the truce, and on March 5, 1918, had to make peace on the most humiliating terms. She had to give up the whole of the Dobruja, the Petroseny coal basin, and the Carpathian passes, to demobilise her Army, to allow Austro-Ger. transport to pass through Moldavia and Bessarabia to Odessa, and a little later to subject completely the whole of her commerce including her oil-fields to the control of Austro-Ger. financial groups. (See also *Russia (History)*).

**POLITICAL CRISES IN AUSTRIA-HUNGARY AND GERMANY.**—*German Dream of 'Mitteleuropa' Realised.*—The overthrow of the old autocracy in Russia produced political crises both in Austria-Hungary and in Germany. For Allied observers the importance of Austria had been overshadowed throughout the war by her dominant partner; but without the active participation of Austria-Hungary the Ger. dream of *Mitteleuropa* could not be realised, nor the vital plan of the *Drang nach Osten*, the creation of a solid block of ter. under Ger. influence stretching from Berlin to Bagdad, by way of counterbalancing Brit. sea-power. By the end of 1916 this dream had become a reality. The Gers. had completely broken up the Austrian armies as separate entities, and not only put them under Ger. commanders but associated them with Ger. troops in every theatre of war. Austria had least desire for war of all the associates of Germany, and, in the first two years of war had suffered very severely. Her armies had borne numerous defeats, and her people were on the brink of starvation, partly owing to the complete failure of the Austrian Gov. to make adequate distribution of food stocks among the poorer elements of the pop. The Ger. hold on the Austrian armies was strong enough to make any prospect of a separate peace with Austria illusory; but the internal condition of the Austro-Hungarian Empire was increasingly dangerous from the Ger. point of view.

**Problem of Oppressed Nationalities in Austria-Hungary.**—The main problem of internal Austro-Hungarian administration was largely the struggle of the other races against the minority Magyar-Ger. rule. It was obvious that if Austria were to reach an understanding with the new rulers of Russia she must adopt democratic methods. Accordingly, after the Austrian peace offer to Russia on April 14, 1917, the Vienna Cabinet decided to summon Parliament, which had not sat since before the war. The Premier resigned, and on June 24 a stop-gap ministry was formed under Dr. Seidler. Meanwhile in Hungary Count Tisza had fallen, but his successor faithfully carried on Tisza's policy of co-operation with

Germany, and the Ger. hold on Austria-Hungary remained as firm as ever. (See *AUSTRIA, Austria-Hungary in the First World War.*)

**Resignation of Bethmann-Hollweg as German Chancellor.**—In Germany the consequences of events in Russia were more startling. When, in May, the chancellor had refused to state his peace terms, he had been supported in the Reichstag by a bloc of the Catholic Centre, the Radicals, and the National Liberals; but in July this bloc went into opposition and joined the Majority Socialists in demanding reform of the Prussian constitution, parl. gov. throughout the empire, and a declaration of war aims on the lines which had just been laid down in a speech in the Reichstag by Erzberger, the leader of the democratic wing of the Catholic Centre Party. He had demanded a declaration in favour of peace without annexations and indemnities. On July 11 the emperor offered direct and secret ballot for the Prussian Diet, but for a week the Reichstag continued to press its full demands. During that week Bethmann-Hollweg offered his resignation, which was accepted. The emperor ignored the Reichstag in choosing his new chancellor, Dr. Georg Michaelis, as likely to be both docile and efficient. But von Kuhlmann, who became foreign minister, was opposed to the military policy. During the summer and autumn of 1917 he showed much skill in trying to estab. Germany's wish for peace both in Allied and neutral countries. At the same time he worked secretly in many directions to strengthen Germany's position and weaken Kerensky's position in Russia in the hope of bringing about the collapse of Russia's power. But while von Kuhlmann secured certain advantages for Germany by his adroit diplomacy, his path was not made easy by the blunders of the Imperial chancellor, who had failed to conciliate the Reichstag and continually ruined the effect of von Kuhlmann's pacific overtures abroad by his reactionary statements on the success of the submarine campaign and the strength of the Ger. front.

**Majority Socialists in the Reichstag.—Fall of Michaelis.**—The errors of Ger. diplomats in S. America and elsewhere also added to von Kuhlmann's difficulties. In addition, von Kuhlmann was continually opposed by the military chiefs. The collapse of all gov. in Russia, for which von Kuhlmann had worked, was really detrimental to his policy, for it gave fresh hope of 'peace by victory' to the reactionary military party, and revived the flagging hopes of the mass of the Ger. people. When the Reichstag met again in Oct. the Majority Socialists interrogated the gov. on their encouragement of Pan-Ger. propaganda in face of the pacific speeches made by von Kuhlmann and the Austrian minister, Count Czernin. When gov. spokesmen tried to make light of the criticism the Reichstag as an expression of their dissatisfaction referred back a new war vote. The situation was aggravated by an Independent Socialist's reference to a mutiny in the

fleet and coupled with an allegation of unjust treatment of the sailors by the gov. Adm. von Capelle averred that the mutiny had been organised in collaboration with Independent Socialist members of the Reichstag. This angered the Socialists, and the chancellor first associated himself with von Capelle's charges and then called for his resignation. Finally the votes were passed and the Reichstag adjourned, but it was clear that Michaelis could not meet the Reichstag again, and the emperor chose as his successor Count Hertling, leader of the Catholic Centre in the Reichstag.

*The Principle of Self-Determination.*—Meanwhile President Wilson's insistence on the ideal of self-determination for oppressed nationalities was gaining ever wider acceptance as one of the main purposes for which the Allies were fighting, and not only among the Allies themselves but among the subject peoples of Austria and a number of other nations which had hitherto preserved neutrality. Abroad, the ineptitude of Ger. diplomacy, and the continued interference with neutral shipping and supplies by the unrestricted submarine warfare, brought more and more nations into the war on the Allied side. Cuba declared war on Germany on April 7; Panama followed on April 10; Siam declared war on the Central Powers on July 22; China declared war on Germany on Aug. 14 and on Austria-Hungary on Sept. 11, and Brazil declared war on Germany on Oct. 26, while nine other countries had severed diplomatic relations with Germany. By the end of 1917 only the Argentine and Chile in S. America had not declared war on Germany. There was a strong movement in Spain for a declaration of war on Germany, but a powerful Germanophil party was able to prevent a declaration. The position of all the other European neutrals was becoming precarious since the tightening of the Allied blockade, and their people often suffered as severely from food shortage as the people of some of the Allied countries.

*FOOD PROBLEM IN GREAT BRITAIN.*—Brit. losses on the Somme and the remoteness of any prospect of the end of the war were beginning to affect the temper of the people. The problem of food supplies was becoming serious with the losses in tonnage from the submarine campaign and the diversion of much of the remaining tonnage to the transport of war material. With the creation of a ministry of food in 1917 and the appointment of Lord Devonport as food controller, steps were taken to meet the serious shortage of grain, and also of sugar and potatoes; but the shortage was followed by high prices, and the situation was not vigorously dealt with until Lord Rhondda took over the food ministry in June 1917. Lord Rhondda instituted an examination of traders' books, and a system of maximum prices for food stuffs based on this examination subject to weekly revision. Finally he instituted a compulsory system of food rationing. (See FOOD CONTROL.)

The first financial measure of Lloyd

George's new gov. was to raise a huge internal loan. The amount raised was £1,000,000,000, or £300,000,000 in excess of the provisional estimate of Bonar Law, the new chancellor of the exchequer. Vast sums were urgently needed, for the cost of the war was increasing at an alarming rate. By the middle of Feb. the average daily expenditure had risen to £5,790,000, and by June, the figure was £7,884,000.

*WESTERN FRONT.—January–April 1917.*—*German Retreat to the Hindenburg Line.*—On the W. front during the first three months of 1917 the Allies compelled the Gers. to retreat to the strong defensive position they had prepared known to the Gers. as the Siegfried Line but to the Brit. as the Hindenburg Line (*q.v.*). By the end of the first week in April the Gers. had been driven back to this immensely strong position. On April 9 the Brit. began their attack along the Vimy Ridge and in front of Arras (*see* ARRAS, BATTLE OF), and by the 11th they had taken the Vimy Ridge, a number of *viss.*, together with numerous prisoners and much war material. A Ger. counter-attack on the 15th failed, and on April 16 the Fr. launched a great attack on the S. part of the Hindenburg Line along the Aisne heights. Nivelle, the Fr. commander-in-chief, had for his immediate objective the S. pivot of the Hindenburg Line at Laon, while to the Brit. had been given the task of attacking the N. pivot of the line around Douai and Cambrai. Nivelle's offensive failed of its main purpose, which was to deal a decisive blow, and after the first few days was abandoned. The second battle of the Aisne (*q.v.*) lasted for a little more than a month, and although it used up a great many Ger. troops and endangered some important Ger. positions, it was really a failure. In the middle of May Nivelle was replaced in the command by Pétain, who reverted to the old tactics of gradual attrition. In the second half of the year the main fighting on this front was conducted by the Brit. in Flanders.

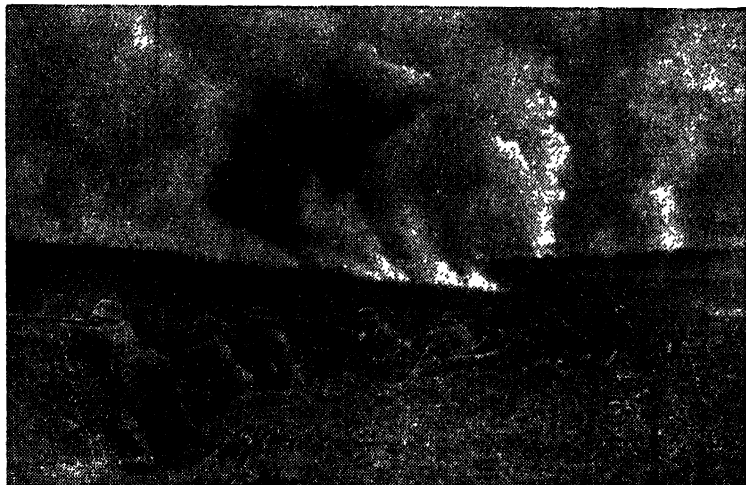
*The Third Battle of Ypres.*—The third battle of Ypres, also known as the battle of Flanders, consisted of prolonged operations lasting from the end of July to the beginning of Nov., in which the Canadians distinguished themselves in the capture of Passchendaele on Nov. 6. From Nov. 20 to 23 the Brit. also secured considerable gains and many prisoners in an advance at Cambrai (*q.v.*). But the general results of the Flanders campaign were small in proportion to the effort, and the actual cost was greater to the Brit. than to the Gers.

*NEAR EAST CAMPAIGNS, 1917.—Fall of Bagdad.*—In the Near E. Allied prestige, which had waned in 1916, was much restored in 1917. The Allies realised that they must crush the Turks if they were to effect anything in the Balkans. The first movements under the command of Sir Archibald Murray, took place in the Sinai Desert. On Dec. 29 the Brit. entered El Arish, the main enemy position, which had been abandoned by the Turks.

On Jan. 9 they captured Rafa, the last Turk stronghold in the Sinai Desert. In Feb. an expedition against the Grand Senussi (q.v.) on the W. borders of Egypt was completely successful and drove him into the interior, where his forces could no longer menace Egypt on the W. In Mesopotamia, where Sir Stanley Maude had succeeded to the command of the Brit. forces in Aug. 1916, great improvements had been effected in supplies, transport, and communication. The Brit. commander decided to strike at the Turkish centre in Bagdad. Early in Dec. the pre-

forces were 80 m. away. The communications of the enemy with S. Persia were blocked, and the threat to India removed.

*British Advance from Sinai.*—Meanwhile Murray continued his advance from Sinai, from the Wadi el Arish to the Philistian plain. The desert railway was being pushed along the coast to form a Brit. line of communication similar to the Turkish military line from Beersheba. At first it was thought that the Turks would offer resistance close to the frontier at Weli Shaikh Nuran; but on March 5



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#### GERMAN STORM TROOPS ON MANŒUVRES NEAR SEDAN, MAY, 1917

parations were complete, and for the next two months the Brit. steadily advanced, clearing the Turks from the r. b. of the Tigris. In the middle of Feb. they attacked also on the l. b., and, having effected a brilliant crossing of the swollen riv. on Feb. 23, were in a position to cut off the retreat of the Turkish troops from Kut; but the attempt was unsuccessful. None the less, the continual advance along the l. b. had so weakened the Turkish position that on the 24th the Brit. forces entered Kut without opposition. Gen. Marshall pursued the Turks to Azizieh, half-way to Bagdad, taking some 4000 prisoners. On March 5, after a week's organisation, the advance was resumed and the following day Ctesiphon was passed without resistance. On the 10th the Turkish position on the Diala R. was captured, and on March 11 the Brit. entered Bagdad. The fall of the city enormously enhanced Allied prestige in the E. By end of April Bagdad was secure from enemy attack, the terminal section of the Bagdad railway was in Brit. hands, and the nearest Turkish

Brit. aircraft reported that they were falling back. Pursuit was impossible, for the Brit. railhead was still too far to the rear, and the Turks took up their new position unhindered from Gaza to Tel el Sheria, with an advanced post at Beersheba on their left wing. The Ger. gen., Kress von Kressenstein, who was in active command of the Turkish forces, had great difficulties to surmount. The Turks were thoroughly disheartened. Starvation and disease were general. Supplies for the troops were very short, and desertion was common. It was essential to engage the enemy as soon as possible to prevent him falling back to stronger positions further N.; and Murray decided to advance up the coast, with Gaza as his object, so as to keep in touch with the sea, secure better water supplies, and leave an easier course for the railway to follow than would have been possible if an attack had been made inland towards Beersheba. The battle opened on March 26, but the early movements were hampered by a sea fog, so that the battle was still undecided when night fell. The Brit.

commander forbore to risk a night attack, and, as Turkish relief columns were approaching, he withdrew his troops to better defensive positions. For three weeks the Brit. were occupied in advancing their railroad and in procuring proper supplies of water for the troops opposite Gaza, while the Turks under von Kressenstein were increased from about two divisions to five divisions of infantry and one of cavalry, and the defences of Gaza were considerably strengthened with new trench systems and great quantities of wire. There was no longer any possibility of taking the Turks by surprise; but in the difficult country it was impracticable to revise the plans in the time available, so that Murray now prepared for a frontal attack. The attack began on April 17, and with the assistance of tanks the outer line of defence was taken with but few casualties. The attack on the main position developed on the 19th, but no considerable advance was made and the Brit. losses amounted to some 7000 men. Murray wished to renew the attack on the following day; but his Army commanders disagreed, and urged him to await reinforcements. Thereafter the troops settled down to a long period of inaction, varied only occasionally by cavalry raids. Murray was then replaced by Sir Edward Allenby (q.v.).

*General Allenby appointed to Command in Egypt and Palestine.*—The check at Gaza was a serious reverse after the brilliant conduct of the Sinai campaign, and for the time it appeared that the Brit. had reached a condition of stalemate similar to that experienced in Gallipoli. The reverse was partly due to the difficulty of the country and partly to the release by the Russian revolution of Turkish troops from the Caucasus, which had been transferred to Syria. It was becoming evident that the capture of Jerusalem must be the ultimate objective of the Palestine force, for, while Jerusalem had small military value, the capture of the holy city would be a resounding political triumph. Allenby observed that Beersheba was practically an isolated fortress, separated by a considerable gap from the formidable main series of fortresses the Turks had now constructed from Gaza eastwards. He therefore determined to secure Beersheba first, since he would then be in a position to take the main fortresses in the rear. Meanwhile he proceeded on Oct. 27 to shell Gaza, so as to give the impression that he intended an attack in force on that city. The attack on Beersheba assisted by a cavalry enveloping movement from the N.E. was successful, and the town was occupied on Oct. 31, some 2000 prisoners and 30 guns being taken. Before developing the attack on the now exposed left flank of the Turkish defences at Gaza, Allenby began a frontal attack intended to draw off the Turkish reserves to that quarter. On Nov. 1 and 2 this operation was carried out with such complete success that Gaza was outflanked on the W. and a reserve division had to be sent to this front from the left flank. Water and

transport difficulties now delayed Allenby's main attack, which had outrun the railroad; but by the 7th Gaza had fallen and the Brit. troops were pursuing the retreating Turks up the coast. The enemy had suffered some 15,000 casualties, including over 5000 prisoners, and the retreating Turks were so demoralised that they could not offer much further resistance. On the 9th he occupied Ascalon, and through intense heat the troops struggled on towards the junction of the Jerusalem railway, which was captured on the 14th.

*Fall of Jerusalem.*—Jerusalem was now directly threatened, and frantic efforts were made to save the city. Allenby seized Jaffa, but was again compelled to call a halt, while he waited for the railway to be pushed nearer his rear. On Nov. 22 the Turks suddenly began a series of vigorous counter-attacks, which continued until the end of the month and prevented the Brit. from making much further advance. But the opportunity was taken to bring up the Brit. guns and improve the roads for the final advance. Meanwhile Jerusalem was in confusion, and when the Brit. attacked on Dec. 8 and 9 the Turkish civilians began to evacuate the city, and on Sunday, Dec. 9, the Turkish garrison retired and Brit. patrols entered. On the 11th Allenby entered by the Jaffa Gate. Meanwhile Sir Stanley Maude had been improving his position in Mesopotamia, but he died suddenly on Nov. 18 of cholera. (See MESOPOTAMIA.—*First World War Campaigns in Mesopotamia.*)

*INTRIGUE IN WESTERN EUROPE, 1917.*—*Stockholm Conference.*—The invitations which had been issued to the Stockholm Conference in April had been vigorously discussed by the Socialists of the W. Allied countries. When the Soviets pressed for a conference on the formula 'no annexations or indemnities' there was some weakening in the Allied refusals. A plenary conference was proposed for Aug., and four representatives of the Soviets toured W. Europe to prepare the ground. It was soon evident that the Soviets had no interest in nationalities and their sole purpose was to prepare for the international class war. Opinion in the Allied countries on the subject of the conference became still more hopelessly divided, and the Trades Union Congress finally repudiated the idea of any conference at that time. But in Aug. the Pope issued an appeal to the belligerent states to consider concrete proposals for peace, which, however, seemed to the Allies all in Germany's favour. President Wilson on behalf of the Allies issued a reply setting forth their view that such terms would involve unending future conflict and the estab. of an armed confederacy to ensure that Germany observed the terms.

*Clemenceau becomes Premier of France*—Successive Fr. Ministers had been so complacent towards pro-Ger. Socialists such as Malvy (q.v.), Caillaux (q.v.), and Polo (q.v.), that it was not until Clemenceau (q.v.) became Premier in Nov. that



their activities were checked. Promptly on his accession to power he arrested and tried Polo and the smaller conspirators, exiled Malvy, and finally in Jan. 1918, had Caillaux arrested and brought to trial before a court-martial on the charge of endangering the safety of the State. The charges against him were, however, never proved.

**ITALIAN FRONT, 1917.**—*Cadorna's Appeal for Allies' Assistance.*—In May 1917 Cadorna made a great effort to outflank one great obstacle to his E. advance, the Bosco di Ternova, by seizing the Bainsizza plateau and the valley of Chiapovano; but this difficult advance failed, and he then turned his attention once more to Monte Ilermada, where the It. gained a footing on May 23, only to be driven off again by an Austrian counter-attack on June 5. It became clear that Italy could not succeed by her own unaided efforts, and in July Cadorna appealed to Britain and France for help. Britain sent some batteries of artillery, but neither could spare infantry. Hence in Aug. Cadorna resumed his attack alone. In spite of certain initial successes, the It. were again driven back by Austrians recalled from Russia, and by the end of Sept. Cadorna's main operations were at an end. The It. losses had been tremendous, with no gains worth mentioning. Ludendorff had for some time been preparing to apply Ger. methods to the It. front, and in Aug. he transferred von Below from the W. front to the It. and gave him command of six Ger. and seven Austrian divs.; the plan was to disperse with the devastating preliminary bombardment, and to rely on picked troops to break through the enemy lines, and to follow up the first of such troops with wave after wave of fresh troops. The part of the line to be selected for this new method was the Isonzo front in the neighbourhood of Caporetto where the It. troops were reported to be disaffected.

*Italian Defeat at Caporetto.*—It was on this front that von Below intended to attack. The attack began on Oct. 24 in heavy rain and snow which helped the Gers. by increasing the element of surprise. The Second Army, which comprised the disaffected troops, broke immediately, so that by the morning of the 25th the Gers. had crossed the Isonzo had taken Monte Matajur, which was 5000 ft. high, and were across the It. frontier. They had nullified in a day all the It. gains of the previous two and a half years. For a full account of this battle see **CAPORETTO, BATTLE OF.**

*British Expedition to Italy.*—The Brit sent a corps under Plumer and the Fr. sent one under Fayolle, and the disaster of Caporetto had the effect of steeling the resolution of the It. people. The Austrians, however, captured the height above the Venetian plain, until in the middle of Dec. they reached the limit of their invasion, from which time the It. with the Fr. and Brit. contingents began to drive them back. The fighting continued well into 1918 without much change in the position. Nevertheless it had been

brilliant military success for the Central Powers.

**FORMATION OF ALLIED COUNCIL AT VERSAILLES.**—At a conference at Rapallo in Nov. 5, attended by Lloyd George, with Gen. Smuts, Sir Wm. Robertson, and Sir Henry Wilson, on behalf of Britain, by Painlevé and Gen. Foch for France, and by Orlando, Baron Sonnino, and Alfieri for Italy, it was decided that an Allied Council should sit at Versailles. Cadorna was sent as It. representative to Versailles, while his place as commander-in-chief was taken by Gen. Diaz (*q.v.*), who had been very successful in the Carso battles. (See also **CADORNA, MARSHAL.**) At the end of this critical year the strong men on the Allied side were Lloyd George, Clemenceau, Orlando, and Wilson. Clemenceau gave valuable support to the newly-emphasised war aims of the Allies, to their determination to secure a lasting peace by the eventual estab. of a League of Nations. But at this point the influence of President Wilson was greatest among the Allied leaders, and on Jan. 8, 1918, he issued a statement of America's war aims embodied in fourteen points. (See **FOURTEEN POINTS.**)

**BRITISH WAR ORGANISATION IN 1918.**—*Allied Naval Council.*—The opening of 1918 found Great Britain shouldering the heaviest burdens she had been called upon to bear during the war. During 1917 the Army had been increased by 820,645 men, and some 700,000 men and 800,000 women had been incorporated in civilian organisations for warwork. A million additional acs. of land had been ploughed, Brit. shipping replacements had reached 624,000 tons during the year, the number of guns available for France had increased by 30 per cent, and the supply of aeroplanes was two and a half times as great as in the preceding year. The ministry of food had regulated the supply of essential foodstuffs, so that in the winter there was no real want. In Dec. an Allied naval council was set up in Paris to co-ordinate naval policy, and by Feb. 1918 the submarine menace seemed to have been largely overcome. Air-raids entered upon a new phase in 1917, when the Zeppelins were largely displaced by aeroplanes which raided various Eng. tns. during the summer in daylight, and, after the defences had been improved, on moonlight nights during the autumn and winter. Though there was no lessening of the determination of the Brit. people to carry the war to a successful conclusion, there was considerable bitterness over the prodigal wastage of Brit. troops in the unsuccessful operations on the W. front during the autumn.

**GERMAN PREPARATIONS FOR SUPREME EFFORT.**—*British Western Front Weakened.*—Lloyd George's gov. did not fully appreciate the position on the W. front, where Germany was preparing a great spring offensive. Brit. and Fr. strength on that front had been weakened by the It. campaign, and the Brit. front had been further extended with little reinforcement. The Brit. Cabinet continued to keep over 390,000 troops in

Britain, possibly because of revived scares of a Ger. invasion of England. Meanwhile, the Gers. were able to transport troops from the E. to the W. front to countervail the slight numerical superiority which the Allies had now secured on that front, and it is probable that they had a margin of about a quarter of a million men in reserve. On the Allied side there was no chance of any immediate increase. Several months must elapse before the Amers. could put any appreciable number into the field, and France had reached the limit of her resources.

*German Military Plan and the Reichstag.*  
—Sometime in Feb., Ludendorff and

point in their rear, and send these troops along their railways to any point on the front selected for the attack long before the Allies could take adequate steps to meet the threat. The essence of the Ger. plan, as of the original Ger. plan at the opening of the war, was speed. The expected Ger. victory was also to be used to restore the shaken reputation of the Ger. Imperial family; for, at the opening of the attack, it was announced that the emperor was in command.

*GERMAN OFFENSIVE OF SPRING, 1918.*  
—*Attack on British Fifth Army.*—The offensive began at dawn on Thursday, March 21, precisely against that sector



Canadian troops of the 87th Battalion resting in a trench near Willerval, April.



A patrol of the 1st Cameron Highlanders (1st Division) at Cunchy, April 17.

*Imperial War Museum: Crown Copyright*

#### THE GERMAN OFFENSIVE OF SPRING, 1918

Hindenburg met the Reichstag in secret session and explained their plan. They promised complete victory in the field before the autumn. It was admitted that the great Ger. offensive must necessarily be costly, the Ger. losses being estimated at a million and a half. The Reichstag approved this plan, which was to be achieved through the isolation of the Brit. Army, effected by separating it from the Fr. on its right and confining it between the Somme and the Channel. This accomplished, the Brit. Army could be held with a few troops and the main attack could then be directed against the Fr., who would collapse under the weight of the attack of the whole Ger. force. The first objective, therefore, must be the junction between the Fr. and Brit., which the Gers. assumed would be weak. Owing to the intricate railway system which the Gers. commanded behind their lines they could concentrate troops rapidly at any

of the Brit. front indicated by Sir Henry Wilson two months before, and, it would seem, also by Gen. Gough commanding the Fifth Army, who had fourteen divs. on the Oise sector, against approximately forty Ger. divs. The Ger. offensive was helped by abnormally dry weather which reduced the strength of the water defences on the right of the Brit. line, while a dense fog favoured the attack on the Brit. forward positions. Ger. infantry crossed the Oise canal at La Fère unobserved, and many Brit. outposts were surrounded before it was realised that the attack had begun. The Fifth Army suffered severely in the first day's attack, and lost ground W. of La Fère and N. of St. Quentin. Byng with the Third Army further N. had also been compelled to abandon many vils., and the Gers. had reached St. Leger in their effort to thrust a wedge between Arras and Cambrai. On the two following days the Gers. made vigorous attacks

along the line of the Somme, and the Péronne bridge-head was abandoned. On the 24th the Third Army surrendered Bapaume and nearly all the gains of the Somme campaign of 1916, while on the 25th they were driven back to their old positions on the Ancre, thus exposing the flank of Gough's Army, whose right and centre had also been driven further back. On the 26th, the Gers. broke through the old Brit. line between Beaumont-Hamel and Hébuterne and reached positions they had not occupied since 1914; but here they were finally held. Gough, however, had to give still more ground, and gaps appeared between his line and Byng's on his left, and between his line and the Fr. on his right. On the 27th it appeared likely that the Gers. would destroy the liaison between the different armies, but the great vigour of the attack had exhausted the attacking armies, their communications now lay across the devastated area, and rain was hampering their movements. When von Below's comparatively fresh Army (originally disposed opposite the Brit. from Arras southward) resumed the attack on the 28th they could not penetrate the battle-zone at any point.

*Failure of German Offensive North of the Somme.*—This was the decisive failure of the Ger. offensive and. N. of the Somme, the Brit. front was now secure; but S. of the riv. the Gers. continued to make some progress. During the next few days the situation continued to be grave for the Allies; but the retreat had now merged into a battle in which they had some successes. A hastily organised Fourth Army reinforced Gough's Fifth Army, which had, however, recovered its equilibrium under extraordinary difficulties; while, at this time, the important decision to appoint Foch as commander-in-chief of the Allied armies on the W. front was taken at a conference on the 25th between Haig, Pétain, Milner, and Clemenceau. On April 4, von Hutier tried to reach Amiens and drove back the Allies some distance further, but did not reach the city. In the thwarting of the Ger. offensive, Canadian troops had played an important part.

*Political Controversy in England over Extension of British Line.*—In his speech to Parliament on April 9, Lloyd George averred that the responsibility lay partly with Clemenceau as the author of the extension of the Brit. line, and partly with Gen. Gough. Since the latter could at the time make no answer, the *ex parte* character of the attack provoked a reply in a letter to the press from Major-Gen. Maurice, lately director of military operations, pub. on May 7th, which challenged the accuracy of ministerial statements. His charges were so serious that the gov. proposed a judicial inquiry. Asquith moved instead for a parl. committee, and the gov., by treating his motion as a vote of censure, escaped all investigation.

*Results of the German Offensive.*—The great Ger. attack had failed in its object of breaking the Allied line; but it had achieved much more than any Allied

offensive during the whole war. By April 4, the Gers. claimed 90,000 prisoners and 1300 guns, and the Brit. Fifth Army had been partly destroyed. (See FRANCE AND FLANDERS. FIRST WORLD WAR, CAMPAIGNS IN.) This great offensive did not exhaust the Ger. effort, which was resumed on April 9; but the offensives that followed were not on the scale of the first, and showed signs of indecision in the Ger. high command. Ludendorff now had to choose between the dangerous admission that the chief object of the offensive had failed and the attempt to palliate the true military situation by a fresh onslaught. Anticipating an attack in Flanders, Haig had arranged to relieve the two Portuguese divs. which had been holding the front from the Lys to La Bassée, but he could only replace them by tired Brit. divs. and the change had only been half effected when Ludendorff launched the attack of April 9 (Battle of the Lys). The Portuguese broke quickly, the Brit. flanks on either side were turned, and the whole centre had been lost in a few hrs.

*Battle of the Lys.*—Between the 9th and the 12th a considerable advance had been secured by the Gers.; but they had lengthened instead of shortened their line and were left in a salient. The necessity of obtaining some commanding positions compelled the Gers. to convert this movement from a subsidiary to a major operation and they continued to hammer away at this sector until the end of the month. Local fighting continued until late in May, but it was clear that Ludendorff's second offensive had met the same fate as his first.

*British Counter-measures.*—Meanwhile, in Great Britain, a new Military Service Act was passed to extend the liability to military service to all men under fifty-one and to bring Ireland within its scope. But the raising of the military age tended rather to weaken Brit. industrial power than to increase military power, and the extension to Ireland only inflamed that country and delivered it over to Sinn Féin, thereby necessitating the diversion to Ireland of large numbers of Brit. troops to engage in a bitter civil war there. A wiser but belated move was the prompt dispatch to France of the 300,000 troops which had been kept in England.

*AMERICAN ARMIES IN FRANCE.—Allied Premiers make an Appeal to America.*—As quickly as troops could be organised, in the early part of 1918, Amers. were sent into line with the Allies. On Jan. 19, 1918, the Amer. 1st Div. took over a sector N. of Toul; the 26th went to Soissons early in Feb., and the 42nd near Lunéville. The 2nd Div. was stationed near Verdun, March 18. Meanwhile a skeleton of the future Amer. Army was being built up with headquarters at Neufchâteau. The attack on Gough's Fifth Brit. Army alarmed the Allies and the U.S.A. Lloyd George sent an urgent request that Lord Reading, the Brit. ambas. to the U.S.A., should ask President Wilson to accelerate the sending of Amer. troops, the Allies undertaking to provide for the manu-

facture of the necessary artillery, aeroplanes, and machine guns, as the Amer. programme of manufacture was still in its early stages.

The Amers. and Brit. between them transported safely through mine-fields and submarines some 2,000,000 Amer. troops to France; and 2,000,000 more were being made ready. But the crisis still continued. Foch had presented to the Allied Prime Ministers a statement of the utmost gravity, pointing out the numerical superiority of the Gers. in France where 162 Allied divs. were opposed to 200 Ger. divs., there being no possibility of the Brit. and Fr. increasing the number of their divs. Foch therefore urged that the greatest possible number of infantry and machine gunners, in which respect the shortage of men on the side of the Allies was most marked, should continue to be transported from America in the months of June and July to avert the immediate danger of an Allied defeat in the summer campaign. He placed the total Amer. forces required at no fewer than 100 divs. The troops were forthcoming, and during the summer 300,000 men crossed the Atlantic every month.

#### GERMAN ATTACK ON THE CHEMIN-DES-DAMES.—*German Armies reach the Marne.*

Ludendorff attacked the Fr. at the Chemin-des-Dames on May 7, and he was able to achieve the most rapid advance of the war on the W. front. Soon the Fr. had lost all their gains since Oct. 1914 and were back again beyond the Aisne. The Brit. divs. were forced to retire to the Aisne. By that time the Fr. had been driven back from the Aisne nearly to the Vesle, and on the 28th they were driven well S. of the latter riv. On the 29th the Gers. broadened their front by taking Soissons, and on the 30th the apex of the salient they had made had reached the Marne between Château-Thierry and Dormans. For three days they had advanced at the rate of 10 m. a day, capturing some 40,000 prisoners and 400 guns. From that time, however, the pace slackened, although the Gers. continued to drive the Fr. back on the W. of the salient along the Savières R. Amer. troops drove the Gers. back S.W. of Château-Thierry on June 4-5, and Brit. troops recaptured Blligny, S.W. of Rheims. The next Ger. attack, on June 9, between Montdidier and Noyon, was a failure.

BRITISH NAVAL RAIDS ON ZEEBRUGGE AND OSTEND.—The purpose of the Brit. naval raids which took place on April 23, on Zeebrugge and Ostend, was to block the submarine and destroyer exits from those ports, both of which were connected by canals with Bruges. These raids hampered the Ger. submarine campaign to some extent and destroyed the residue of Ger. sea-power. (See OSTEND, and ZEEBRUGGE.)

THE ITALIAN FRONT.—*Austrian Advance.*—With the check they had suffered in their offensive on the W. front, the Gers. could only hope for success in the Austrian offensive launched against the Its. on the Piave on June 15. No Ger. troops could be spared for this offensive, and more-

over, the Its. had laboured strenuously to strengthen their defences while the front had been quiescent during the spring. The Austrians were in no condition to conduct a successful offensive, but it was hoped that Ger. tactics might supply the place of Ger. troops. There were two battles, one in the mts. whose object was to turn the whole It. front on the Piave, and the other a frontal attack across that riv. between the Montello, the pivot of the mt., and riv. fronts and the sea. The int. attack was the more promising, but achieved less success. That front was partly held by Fr. and Brit. troops, and an insignificant advance which the Austrians made on the 15th was stopped on the following day. The attack on the Piave was at first more successful; a good deal of the Montello was captured, a serious impression was made on the It. right wing at San Dona di Piave, and fourteen new bridges and nearly 100,000 Austrian troops were thrown across the riv. But fortune favoured the Its., for torrents of rain flooded the riv and broke ten of the Austrian bridges.

*Italian Counter-attack on the Piave.*—On the 18th the counter-attack began, and by a brilliant combined movement by soldiers and sailors the Austrian left was turned on the 21st. On the 22nd a general retreat across the riv. was ordered. It was skilfully conducted, and the Austrians escaped with slight losses, considering the precarious position into which they had fallen. Their offensive had been a complete failure, but Gen. Diaz did not follow up his success.

#### MARSHAL FOCH'S COUNTER-OFFENSIVE.

—*German Retreat Begins.*—Ludendorff had no choice but to proceed with his offensive, which had now become a gamble. His next attack began on July 15 with the object of encircling the Montagne de Rheims, the chief bastion of the line of communications between Paris and the E. front on the Meuse. Simultaneous attacks were made to the E. and to the S.W. of Rheims. The first was unsuccessful; but on the S.W. the Gers. advanced 3 m. across the Marne. But by the evening of the 17th the Allied forces were successfully counter-attacking all along the line, and at dawn on the 18th Foch delivered the blow which was the turning point of the whole war. His strategical plan was brilliantly conceived. In the forests of Compiègne and Villers-Cotterêts, he had assembled reserves in considerable numbers. From the Aisne S. to the Ourcq, Mangin commanded an Army containing the pick of the Fr. colonial troops, and thence to the Marne was Degoutte's Army which included five Amer. divs. Before them ran the Ger. flank weakly guarding the line of communications with the Ger. front on the Marne. Led by light tanks, the Fr. early on the 18th broke through the Ger. defences on a front of 27 m. and advanced from 2 to 5 m. towards the Soissons-Château-Thierry road. By the 20th the Gers. had regained the N. bank of the Marne, but without serious loss. On the 21st they abandoned Château-Thierry, and on Aug. 2 the Fr.

were in Soissons. By the 3rd the Gers. had been driven across the Vesle and the salient had been flattened out. Elsewhere there were signs that the Gers. were breaking. On July 4 Austrians and Amers. together had captured Hamel. On the 19th the Brit. had recaptured Meteren at the apex of the Ger. salient across the Lys, and Merris fell on the 30th. On Aug. 4, the Gers. withdrew from all their ground across the R. Avre. But the first great success was Rawlinson's advance with the Fourth Army on the Avre and along the road from Amiens to St. Quentin on which the Gers. had made their W. drive in March. On the first day the Gers. were driven back 7 m. Thenceforward the advance continued steadily all along the line.

*American Attack on St. Mihiel Salient.*—With Amer. troops now pouring in, Allied superiority in numbers was merely a question of time; for even with their troops drawn from the Russian front the Gers. could not replace their losses. Foch now allowed Gen. Pershing to attack the St. Mihiel salient, which had been held by the Gers. since 1914. The reduction of this salient would prevent the Gers. from placing the Paris-Nancy railway under their artillery fire and would also free the railway leading from St. Mihiel to Verdun. The salient was in difficult wooded terrain with the enemy holding the heights of the Mouse. The Allies sent an ample force of heavy artillery. At dawn on Sept. 12, after four hrs. of violent artillery fire, the attack was launched and was successful; 16,000 Ger. prisoners were taken, as well as 443 guns and a large quantity of material and supplies. On the 15th both Austria and Germany made overtures for peace, but President Wilson returned an unsympathetic reply.

*British Advance through Flanders.*—Meanwhile the Brit. were pushing forward in Flanders. On Sept. 27 the 1st and 3rd armies forced the Canal du Nord and by the 30th the Brit. menace forced the Gers. to surrender St. Quentin to the Fr. On the same day Brit. and Colonial troops took points both N. and S. of Cambrai. Of the four operations concerted by Foch with Haig, those of the Amer. and Brit. had been successful, and the Belgian attack from Ypres on Sept. 28 equally so, with the capture of Dixmude on the 29th; while the third resulted in the gradual driving back of the Gers. in the combined Belgian and Brit. attacks from Armentières, La Bassée, and the whole of the remainder of the Drocourt-Queant line. The Fr. and Amers. had great difficulty in the Argonne and on the Meuse, but progress all along the Fr. front continued during Oct., and on the 11th the Fr. took the Chemin-des-Dames and on the 13th La Fère and Laon. The check to the Amers. enabled the Gers. to transfer reinforcements to Cambrai and Valenciennes, so that Cambrai did not fall until the night of Oct. 8. On the 10th Le Cateau fell.

*Closing Battles of the Western Front.*—In Oct., Belgians and Fr. troops under

Degoutte and the Brit. Second Army under Plumer attacked the whole Flanders front, and by the 17th Ostend had been abandoned, on the 19th Zeebrugge and Bruges, and by the 21st the Gers. had been driven back 20 m. from the sea and were trying to make a stand on the Lys Canal in front of Ghent. To the S., also, the withdrawal was equally complete. Lille and Douai were entered on the 17th, and by the 21st the Brit. Second and Fifth armies had advanced to the Scheldt on a front of 20 m. From the 17th to the 25th fighting continued along the line of the Selle, and these battles yielded 21,000 prisoners. On the 26th Ludendorff resigned. All Germany's other allies had collapsed, and she was left alone to meet the decisive battles of early Nov. The decisive actions took place on the right and left of the Allied line, and were carried out respectively by the Amers. and the Brit. On Nov. 1 the Ger. line on the Meuse was broken, and during the next few days the Amers. rapidly followed up their advantage, until, on the 7th, they reached Sedan. Pershing's great attack on the Meuse-Argonne Front began on Sept. 26 and lasted almost continuously until the very eve of the armistice, when the Amers. had all the Argonne in their hands. (See ARGONNE.) In the meanwhile the Fr. centre was also advancing, and on the morning of Nov. 11 the Allies were converging on Namur. This rapid pursuit of the Ger. centre had been made possible by the final blow given to the Gers. by the Brit. forces in the battle of the Sambre in co-operation with Debeney's Army southwards. A great victory was won, which definitely broke the Ger. resistance. By the 9th Maubeuge itself had fallen; Tournai was occupied on the same day, and early on the 11th the Canadians captured Mons. At 11.0 a.m. on that day fighting ceased all along the W. front, according to the terms of the armistice which had been arranged (considered in the next section), and the Brit. Army thus ended its campaign on the W. front where it had begun it four years previously.

*THE ALLIED VICTORY.*—President Wilson's Terms to Germany.—Towards the end of Sept., it was obvious that the Ger. offensive in the W. had failed, while Bulgaria and Turkey were on the verge of defeat and Austria was pleading for peace at any price. The effects of the Brit. blockade was now felt, and starvation was rampant in the countries of Central Europe. The Ger. high command was compelled to urge the civilian authorities to hasten their negotiations, but it was first necessary to set up a gov. in Germany with which the Allies would agree to negotiate. On Sept. 30, the Emperor accepted the resignation of the secretary, and all the other ministers resigned their posts. The most urgent necessity was to provide an imperial chancellor who would represent the new democratic attitude so essential as a façade for negotiation. The emperor chose Prince Maximilian of Baden, cousin of the grand duke of Baden and president

of the Upper House of the Baden legislature. On Oct. 4, he sent a note to President Wilson, asking him to undertake the work of restoring peace, and to invite the Allies to send plenipotentiaries to open negotiations. He stated that Germany accepted the president's proposals set forth in the Fourteen Points (q.v.) as a basis for peace discussions. He asked for an armistice. On the same day the Austro-Hungarian Gov. sent a similar message to President Wilson: he asked if Germany now accepted the terms he had previously laid down, and then demanded a complete withdrawal of the troops of the Central Powers from invaded ter. Thirdly he asked if Prince Max spoke for the authorities of the Ger. Empire who had so far conducted the war. The Ger. reply delivered on the 12th answered the president's first and third questions in the affirmative, and expressed the willingness of Germany and Austria to evacuate invaded ter. if a mixed commission could make the arrangement. But only an armistice involving surrender could secure to the Allies the military advantage won with such great effort. Prior to Oct. 14, on which date Wilson replied, events had occurred which were not without their bearing on the Allies' attitude. On the 10th the Irish mail boat had been sunk with the loss of nearly 500 lives. On the 14th was issued the report of a Brit. committee on the harsh treatment by Germany of prisoners taken in the spring of 1918. Furthermore, in their retreat the Ger. armies were burning and looting to render the Allied pursuit as difficult as possible. Wilson announced that no armistice could be considered while Germany continued these unlawful and inhuman practices. He also asked for some guarantee that the Ger. Gov. was no longer the arbitrary power against which the Allies had been fighting, and emphasised that the conditions of an armistice must be left to the Allies' military advisers, and that no conditions could be accepted which did not absolutely safeguard the Allied military supremacy. On Oct. 20 Germany agreed to these demands, trusting to the president to approve no demand 'irreconcilable with the honour of the Ger. people.' The Ger. Gov. claimed that the new gov. in Germany was free from all arbitrary influence, and had been completely democratised. On the 23rd Wilson rejected this claim. 'The gov. of the United States, cannot deal with any but veritable representatives of the Ger. people, who have been assured of a genuine constitutional standing as the real rulers of Germany.' Acceptance of these terms implied complete surrender, and on the 27th Germany accepted them, declaring that peace negotiations would be conducted by a people's gov.

*The Armistice with Germany.*—At five o'clock in the morning of Nov. 11, 1918, an armistice was signed between Germany and the Allies, and fighting ceased on the W. front at 11 a.m. on that day. The terms of the armistice included the immediate evacuation of all conquered ter. and withdrawal behind the Rhine, leaving

the whole l. b. and all important bridge-heads open to Allied occupation and a neutral zone on the r. b.; the repatriation of all the transported inhab. and Allied prisoners of war; the quashing of the treaties of Brest-Litovsk and Bucharest, and the withdrawal of all Ger. troops from ters. formerly belonging to Russia, Rumania, and Turkey; the surrender of thousands of guns, locomotives, aeroplanes, of all submarines fit for sea, and of the greater part of the Ger. navy. The surrender had been forced upon Germany by the imminence of military collapse, and revolution quickly followed. It was precipitated by an order to the Ger. fleet to fight. The crews mutinied and the revolt spread during the first week of Nov. to Kiel and other ports, and thence throughout Germany. Every Ger. throne was overthrown, and on Nov. 9, the emperor abdicated, fleeing with the crown prince to Holland. The crowning humiliation was the peaceful transference of the Ger. navy to Scapa Flow on Nov. 21, to be scuttled by its own crews on June 21, 1919. Only in one remote Ger. outpost did an audacious commander continue to resist until Nov. 25, namely in Ger. E. Africa, where an entirely isolated force under von Lettow-Vorbeck (q.v.) had carried on a brilliant guerrilla war all through the four years of war.

*EVENTS IN RUSSIA (1918-1919).*—*Bolshevik Relations with Germany.*—After the treaty of Brest-Litovsk, the Ger. relations with the Bolsheviks varied from equivocal association to open hostility. During April and May, Trotsky made abortive efforts to raise a Red Army to drive the Ger. invaders from Russian soil; but with the advance of a Czechoslovak contingent in the S.E., Germany was forced to make an agreement with Lenin, by which she underlook not to advance farther E. than a specified line from the gulf of Finland to the Black Sea, and the Bolshevik forces were therefore able to give their undivided attention to the Czechoslovaks on the Volga. But in Finland, where Germany had hoped for a new outlet for her influence, Red Guards and White Guards continued to fight, and although a Bolshevik ambas. was sent to Berlin, and a Ger. ambas., Count Mirbach, to Moscow, the Count was assassinated on July 7, and his successor, Helfferich, paid only a hurried visit and departed for Berlin to avoid a similar fate. In the Ukraine Germany pillaged the country of supplies for her own use, so that everywhere the peasants rose in revolt, and there were many murders and guerrilla warfare, culminating in the assassination on July 30 of Field-Marshal von Eichhorn (q.v.) in the streets of Kiev. The Ukraine had previously been made into a Ger. prov. administered by an ataman, Gen. Skoropadski, who was nominated by Berlin; Ger. rule was unenlightened, and resulted in this universal rising, which had its effect throughout Russia. Meanwhile in Russia the attacks of the Czechoslovaks and the Allied intervention (see below) had put the wildest elements in power. On July 16, the ex-

(sar and his family were shot. On Sept. 6, Lenin signed three further treaties with Germany, giving every kind of security for the satisfaction of the Ger. claims. The Baltic provs. were to have their frontiers defined as Germany pleased. Baku and its oil region was to be made a Ger. preserve, and immediate payment was to be made by Russia to Germany of £50,000,000 in goods and £300,000,000 in gold, and thus from a bankrupt country, where industry was at a standstill. From June 1918 onwards the Bolsheviks were recognised as the declared foes of the Allies; but to bring help to the White armies and to the Czechoslovaks seemed impossible, since all ways into Russia were closed except by the Arctic or the Pacific. These Czechs, now stranded in Russia, had gone there originally to fight against their Austro-Hungarian masters, hoping thus to facilitate the creation of an independent Czechoslovak state.

*British Expedition to North Russia.*—In Feb. and March 1918 the Brit. had effected a landing at Murmansk, at the head of the Kola inlet, and at Pechenga, the nearest Russian port to the Finnish frontier. The arrival of Fr. and Amer. cruisers made the occupation international. The local Soviet worked with the Allies, and this landing was in fact approved by Trotsky. Then came the Ger. alliance with Finland who was promised all the ter. lying between her E. borders and the White Sea. To meet this threat Allied reinforcements arrived in June, under Gen. Poole. Presently the Bolsheviks changed their policy and demanded the departure of all Allied forces from Russia. This demand was refused by the Murman provisional gov., which threw in its lot with the Allies. For three months there followed attacks from the Finnish borders which were beaten off by Allied troops assisted by local levies, until Finland finally gave up her desire for conquest and Germany was too fully occupied elsewhere. The isolation of the Murman coast deprived the occupation there of much of its strategic importance, and therefore on Aug. 2, Gen. Poole by a surprise attack occupied Archangel. In Archangel there were immense quantities of war material sent by the Allies to Russia, which the Bolshevik Gov. was now commandeering and selling to the Gers., and the Bolsheviks had imposed their gov. by force on the prov., which was in a starving and desperate condition. The Allies therefore undertook to feed the people, prevent the disposal of the war material to Germany, and estab. a free local gov.; they then attempted to push southward to join hands with the right wing of the Czechoslovaks W. of the Ural Mts. But the Allied troops were far too few and failed to join the Czechs.

*The Czechoslovak Armies in Siberia.*—In Siberia the situation was more hopeful but also more complicated. There were some 120,000 Czechoslovak troops, some at Vladivostok and some on the W. borders of Siberia, while between them lay the Trans-Siberian Railway, held in places by Bolsheviks and Austro-Ger. prisoners. There were a number of scattered Russian

'white' troops, some in the Far E., some at points along the line, and a considerable number under Alexeev (q.v.) in the Don and Kuban provs., but separated by a wedge of Bolshevik forces from the westernmost Czechoslovaks. The Allied policy vacillated as at Archangel, and in the same way the forces finally sent to the E. were too few to be effective. Japan was willing to intervene in E. Siberia, but was not interested in the W. developments, while America refused to be drawn into the adventure at all except under the most stringent conditions. From first to last the Czechs had to bear the brunt of the contest themselves, and throughout the summer abortive discussions continued among the Allies. On Aug. 3 a Brit. contingent reached Vladivostok to find the Czechoslovaks hard pressed. On Aug. 12 a Jap contingent followed, while Fr. troops had already arrived, and Amers. appeared on the 16th. By Sept. 5, the Czechs with this Allied assistance had cleared the lines of the railway for the whole distance from Vladivostok to the Volga. But the smallness of the numbers of the Allied troops and the continual difficulties with the various local govts. rendered impossible any rapid movement to the help of the Czechoslovaks on the Volga. Help was urgently needed by these troops, for at the beginning of Sept. their ammunition was running low and together with their Russian contingents they numbered only some 60,000 against 100,000 Bolshevik troops supported by the Gers.

*OPERATIONS IN THE CAUCASUS, 1917.* 18.—Meanwhile, in the Caucasus, after the revolution of March 1917, a Transcaucasian Gov. had been proclaimed under the influence of the people of Georgia. There was anarchy among the Russian troops in the Caucasus, and Przhevsky, who had succeeded Yudenitch, was compelled to ask Turkey for an armistice. The advance of the Turks began to weaken the allegiance of the Tatars to the new gov., and in March 1918 came the Brest-Litovsk treaty making over Batum, Kars, and Ardahan to Turkey. Later Turkey increased her demands and at a conference held at Batum in May the Georgian delegates refused to accept them. The Transcaucasian Gov. had ceased to exist and an independent republic of Erivan was proclaimed for the Armenians, under Turkish protection, and Georgia was compelled to appeal to Germany. Germany was determined to keep control of the Baku oilfields, and therefore decided to use the Georgians as her instruments to this end. Gen. Kress von Kressenstein was recalled from Syria and sent to the Caucasus, and Ger. troops were marched into Georgia. At a conference at Constantinople in July an attempt was made to settle Germany's differences with her ally, and the Turks were informed that they must abide by the Brest-Litovsk treaty. The Turks ignored this note and continued their advance towards Baku. The rift between Germany and her ally was widening. These events directly interested Britain,

for not only did they prejudice the Brit. Mesopotamian campaign, but also the whole future of Persia and the immediate hinterland of India. Events E. of the Caspian were equally disquieting. After nearly a year of contest the soviet of Tashkent had ousted the provisional gov. of Kokhand, and in May Russian Turkistan had been declared a soviet republic. The nearest Brit. troops were the small contingents in Persia and Marshall's Army in Mesopotamia, and their problem was to keep the road from Bagdad to the Caspian open against Turkish attacks from the W. and to check the advance of the Transcaspian Bolsheviks. It was evident, too, that if the E. front were to be restored the Caspian and its shipping must be controlled, which meant that Baku must be held against the Turks. A Brit. force was sent to Transcaspia and after many difficulties succeeded in inflicting a severe defeat on the Bolsheviks. This remote operation had really great political importance for Britain, since the railway from Merv to Kushk ended within two days' ride of Herat, the key to Afghanistan. In Baku itself the Bolshevik Gov. was overthrown on the night of July 25, and the new gov. asked for Brit. assistance. They had control, for the moment, of the shipping on the Caspian and sent transports to Enzeli to fetch the small Brit. force under Maj.-Gen. Dunsterville, which was now more than a thousand m. from its base and had to depend for assistance on the local levies, Armenian and Russian, the former of whom refused to fight on Aug. 17, and soon afterwards went home. Unexpected help, however, came to Dunsterville from the Russian leader, Bicharov, who took Petrovsk on the Caspian 200 m. to the N., and sent help to Baku. After a serious rearguard action the Brit. evacuated Baku and reached Enzeli.

**TURKS DEFEATED IN MESOPOTAMIA AND PALESTINE.**—Marshall in Mesopotamia spent the summer in consolidating his position, and when he advanced on the Tigris in Oct. it was against a beaten enemy. Although in these confused operations the Allies had failed to re-cremate the E. front except in isolated parts, they had upset Germany's forecast of events, and it was left to Allenby in his Palestine and Syrian campaign to drive the Turks out of the war with the resultant collapse of all Germany's E. dreams. On Sept. 19 his troops drove back the main Turkish forces, while his cavalry burst through to the right and then, wheeling, cut off the retreat of nearly the whole of the Turkish forces. By the 25th, co-operating with the Arab forces of the Emir Faisal on the E., Allenby had rounded the Lake of Galilee, the number of his prisoners reaching 45,000. Damascus fell on the 30th, and the Fr. troops co-operating with Allenby took Beirut on Oct. 7, while the Brit. took Sidon. On Oct. 26 Aleppo fell, and on the 28th Allenby's troops reached Muslimieh, the junction on the Bagdad railway which was regarded as the nodal point in the Ger. hold on the E. Marshall's advance

up the Tigris and his occupation of Mosul now compelled the Turkish Army there to surrender, and on Oct. 30, an armistice was signed. The Allies were now in a position to occupy the forts on the Dardanelles and the Bosphorus and to make free use of the straits.

**COLLAPSE OF BULGARIA.**—Meanwhile in the Balkans events began to move towards the final collapse of Bulgaria. The Allied front in the Balkans had been quiescent since the futile offensive of May 1917, and various adjustments had taken place, the new Gk. Army replacing many of the Fr. and Brit. troops, now representing the largest Allied contingent. In June Gen. Franchet d'Esperey succeeded Guillaume as commander-in-chief. The morale of the Bulgarian troops had begun to fail and desertions were frequent, while King Ferdinand of Bulgaria himself, realising that defeat was imminent, was seeking a way out of his difficulties. During July the Fr. and Its. moved forward, but were repulsed by counter-attacks. There was a lull until the middle of Sept. when the Allies launched a great attack in which the Serbian troops played a notable part. By Sept. 22, the Bulgarians had fallen back from the Doiran front closely pursued by the Brit. and the Gks. On the 24th Fr. troops entered Prilep, capturing huge quantities of stores. By the evening of the 25th the Serbians had taken the Babuna Pass and the tn. of Ishtip; they were close to Veles, and Uskub was almost within their grasp. The Bulgarian front was cut in two, and on Sept. 30 an armistice was signed at Salonika. Meanwhile the Allied armies had been sweeping forward. On the 27th the Brit. took Strumnitza and the Serbians captured Veles, while on the 30th Fr. cavalry entered Uskub. On Oct. 4 Ferdinand abdicated in favour of his son Boris, and retired to Hungary. The Allies advanced to the Danube. On Oct. 12 the Serbians entered Nish, and by the end of the month they were in Belgrade.

**DISINTEGRATION OF AUSTRIA-HUNGARY.**—*Austrian Defeat on the Piave.*—These events were the deathblow to the already disintegrating Austro-Hungarian Empire. In the last week of Oct., Count Andrássy, who had taken Burian's place as foreign minister, made a journey to Switzerland to attempt to negotiate with the Allies, but found no approach possible. But the Austrian Army in Italy was still in being, and until that Army was put out of action the Empire remained. Gen. Diaz, the It. commander-in-chief, had now under his command contingents from almost all the chief Allied countries. Diaz aimed at driving a wedge between the Austrian forces in the mts. and those in the plain, after which he could deal with each section separately. The first step was the crossing of the Piave, now in flood, and presenting especial difficulty opposite the It. Tenth Army, commanded by the Brit. gen., Lord Cavan. The riv. here was a m. and a half broad, with innumerable rapid streams between many is., the largest of



which was called the Grave di Papadopoli, some 3 m. long. On the night of Oct. 23 the Brit. effected a footing on the is. and held the position for two days until on the 25th they were joined by other It. and Brit. troops, and were then able to begin the bridging of the main channel. Meanwhile the Ita. had been fighting a costly holding battle on the Grappa, which the Austrians intended as the main attack to distract attention from the Piave, which they believed the floods had made safe. On the 27th the Tenth Army attacked and gained sev. positions on the E. shore of the Piave. Severe fighting continued until the night of the 28th, but on the 29th Cavan (*q.v.*), moved steadily forward; on that day the Austrians were in full retreat. By the 30th Diaz had driven a wedge securely between the two halves of the Austrian front. From this stage the retreat became a rout. On the 31st the collapse was complete, and Czech and Polish battalions surrendered *en masse*. On Nov. 1 the Grappa front gave way. On the 4th the Brit. forces had crossed the Tagliamento, and by the evening of that day the Sixth Army was far over the watershed and in the outskirts of Trento itself. The Austrian armies had collapsed, and left in the Allies' hand more than 300,000 prisoners and 5000 guns.

**Armistice with Austria-Hungary.**—On Nov. 4, an armistice came into effect and hostilities ceased. On the evening of Nov. 3, a detachment of Bersaglieri landed at Trieste, and the city passed into It. control. Thus all Germany's allies were finally beaten. The Piave disaster precipitated the collapse of the Austro-Hungarian Empire. On Oct. 18, Czechoslovakia had proclaimed her independence; now other Slav states within the Empire followed suit, and on Nov. 13 Austria became a republic.

**CASUALTIES.**—The exact total of the casualties sustained during the war will never be accurately known. Some countries kept only approximate or imperfect statistics. The total killed among the military pop. of both sides has been estimated to exceed 10,000,000. Total killed in the Brit. Empire (including Ireland and India) was 1,089,900; France, 1,393,388; Russia (approximately), 1,700,000; Italy, 460,000; Rumania, 335,076; and the U.S.A., 115,660. Total number killed among the Central Powers was: Germany, 2,650,466; Austria-Hungary, 1,200,000; Bulgaria, 101,274; Turkey, 300,000. (For further details see CASUALTIES.)

**COST OF THE FIRST WORLD WAR.**—In 1924 the Bankers' Trust Company of New York issued the following estimate of war costs in pounds sterling.

Nation	Total expenditure £
British Empire, excluding the Allies, ..	13,577,900,000
British Empire ..	27,421,700,000
Total, Allies ..	40,999,600,000
Central Powers ..	15,122,300,000
Grand Total ..	56,121,900,000

It should be noted that the figure of Brit. (including the Empire) war expenditure estimated by H. F. Brady (*British War Finance*, 1927) is £7,615,497,360, a much lower estimate than that given by the Bankers' Trust Company.

**THE EFFECTS OF THE FIRST WORLD WAR.**—The War exceeded, in the scale of its operations, the number of its casualties, and the total of its costs, any previous known human conflict. While the main battleground had been in Europe and Asia Minor, it had involved the peoples of every continent. It was a global war. It occasioned the collapse of sev. great empires, some of which, like the Ger., were of comparatively recent foundation, others, like the Russian, had been built up through the centuries, and, with the emergence of a number of small Central European states after 1918, completely altered the map of Europe and Asia Minor. Its cost, in men and material, was particularly heavy in France and Germany. A burden of reparations was laid on Germany which could never be fully repaid and which, even if partially repaid, would have upset the world economy. The struggle had tended to exalt the power of the military leaders: this was particularly apparent among the Central Powers, but even in England, where parliamentarianism existed as a strong check, there was frequent friction between civil and military depts.

The war was so colossal in its scale that it gave impulse to new ideas, new inventions, new political and social conceptions, so that the world of 1918 emerged in nearly every sense, entirely different from that of 1914. In England, it did much to further the enfranchisement of women, and to increase the influence of the working-class. In Russia, it made possible the successful Bolshevik revolution. The war, unlike previous struggles, involved everyone. Not only did the scale of the military operations make homeless, temporarily or permanently, thousands of civilians, but submarine and aerial warfare ensured that non-combatants and even neutrals far behind the fighting lines, might be involved. Results showed that wars could be successfully prosecuted by great armies whose members were, in the main, volunteers or conscripts, hastily trained. The war demonstrated the capacity of endurance of soldiers and civilians alike, and showed that nations could sustain hitherto unprecedented losses, and yet avoid total defeat. The immensity of the destruction, both material and moral, and the sudden transformation of society indirectly caused by it, produced a Europe without the sense of stability and belief in progress which had been characteristic of the Europe of the late nineteenth century, while the telling material contribution made in 1917-18 by the U.S.A. to the Allied cause marked the emergence of the U.S.A. as a major world power.

**PEACE TREATIES.**—Treaty of Versailles, signed by the Allies and Germany June 29, 1919, and ratified at Paris, Jan 10, 1920; Treaty of St. Germain-en-Laye

between the Allies and Austria, signed Sept. 10, 1919, and ratified in Paris, July 16, 1920; Treaty of Trianon, between the Allies and Hungary, signed June 4, 1920; Treaty of Neuilly, between the Allies and Bulgaria, signed Nov. 27, 1919, ratified in Paris, Aug. 9, 1920; Treaty of Sèvres, between the Allies and Turkey, signed Aug. 10, 1920, but never ratified; Treaty of Lausanne, between the Allies and Turkey, signed July 24, 1923, and ratified in the same year. (See under the names of the treaties.)

See also under BLOCKADE; AERIAL WARFARE; CASUALTIES; CONSCRIPTION; CHEMICAL WARFARE; FOOD CONTROL; SUBMARINES; TANKS AND ANTI-TANK WEAPONS; TRENCH, etc.

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#### World War, Second (1939-1945)

**BEGINNING OF THE WAR IN EUROPE: Causes.**—The Second World War began on Sept. 1, 1939, with Germany's attack on Poland, followed two days later by declarations of war on Germany by Great Britain and France, both having given pledges to Poland. Some roots of the conflict, however, are found in the Sp. civil war, in the course of which both Germany and Italy helped Gen. Franco's Nationalist forces with arms and men, ostensibly in pursuance of their anti-Comintern Pact (*q.v.*), but in reality to further, positively, the spread of Fascism. The prin. cause, however, was the aggressive policy of the Ger. National Socialist Gov., which itself had its origins in the rise of Hitler to the post of chancellor, the repudiation of the Locarno Treaties, and the rearmament of Germany. For some seven or eight years before the outbreak of war between Ger and the Allies the Nazi Gov. had subordinated the entire social and internal political life of Germany to the creation of a vast war-machine, which, as it approached completion, enabled Hitler to occupy Austria in March 1938, and Czechoslovakia a year later, both effected without resistance. In the same month the Memel tor was incorporated in the Reich, and Italy invaded Albania (March 16) and in a few days reduced it to subjection.

The milestones along the road of Germany's military and aggressive renaissance were plain for all to see, and there were not wanting a number of warning voices in Britain. Time and again in the period of his exclusion from office Winston Churchill painted in memorable language the picture of Germany's terrible military preparations; but Ramsay MacDonald preferred to follow the *ignis fatuus* of Geneva protocols and international treaties of 'mutual guarantee and assistance' and all the circuitous unrealities of the Covenant of the League of Nations;

Mr. (later Earl) Baldwin was deceived on the facts of Ger. rearmament and chose to regard Churchill as an alarmist; and Neville Chamberlain preferred the policy of 'appeasement.' Yet none of these statesmen is to be entirely blamed for faults of omission which were at the least, more the political reflection of the popular attitude, not only in Britain but, still more, in France, where the people were weakened by a most pronounced swing to the 'Left' in politics and also by their belief in the absolute physical protection afforded by the Maginot Line.

From about 1937 Britain gradually awoke to the fact that she must rearm; but the rate of her rearmament was so slow that she found herself at war with Germany without having made up much of the leeway, and actually facing the disaster of a formidable invasion while still further behind Germany in the rate of rearmament, before calling upon Mr. Churchill to assume the reins of power and pursue an energetic policy more calculated to match the fearful menace which now threatened the Brit. Isles. It is matter for historical speculation how far the rearmament and will-to-war of the Ger. people grew out of a determination to avenge their humiliating defeat in 1918 and to nullify the fancied injustices of the Treaty of Versailles, or, on the other hand, whether this process was largely unconscious. In the mind of the Ger. leader the pattern and scope of his mission to restore the Ger. Empire, to enlarge its confines beyond limit and to acquire Colonial possessions (see COLONIAL QUESTION), were clearly enough conceived, but it is probably also true to say that the Ger. people were by no means so politically-conscious as to give practical expression to a policy which, in its gradual realisation, spelt not only privation but the loss of such small measure of social liberty as was commonly extended to the nation. In short, the demagogue Hitler, himself a neurotic and emotional subject, played on the self-same characteristics of his fellow-countrymen, beginning with the negative policy of persecuting the Jews.

This policy was effective in eliminating from the Ger. body politic all such elements of Socialist weakness as might have flowed from a sense of inferiority, besides placing large funds in the hands of the Nazi party with which to organise the *Reichswehr*, the nucleus of the great army it was proposed to build up. In this process of welding a totalitarian machine, Hitler found congenial and often very able coadjutors in Goering (*q.v.*) who organised the Ger. Air Force; Goebbels (*q.v.*), who built up a formidable ministry of propaganda; Streicher (*q.v.*), who carried out the Jewish pogroms; and Himmler (*q.v.*), who developed the Secret State Police (*Gestapo*), the symbol of the Nazi spirit. Hitler's dream of *Weltmacht*, however, depended on swift execution, and as soon as his plans were matured he began to use his war machine with ruthless celerity and with an utter disregard for any and every pledge he had given in the past.

The political situation in Europe up to the Ger. occupation of Czechoslovakia is dealt with in the article CZECHOSLOVAKIA. The governing factor in Ger.-Polish relations from the beginning of 1934 was the Ger.-Polish agreement, signed on Jan. 26, 1934, which was valid for ten years and provided that in no circumstances would either party 'proceed to the application of force for the purpose of reaching a decision' in any dispute between them; and in the succeeding five years Hitler made a number of speeches friendly to Poland. But after the seizure of Czechoslovakia the European situation rapidly deteriorated, for it was evident that the Ger. action was in complete disregard of the principles laid down by the Ger. Gov. itself in the Munich agreement between Hitler, Chamberlain, Daladier, and Mussolini. (See CZECHOSLOVAKIA and MUNICH PACT.) On March 31, Chamberlain announced the assurance of Brit. and Fr. support to Poland 'in the event of any action which clearly threatened Polish independence, and which the Polish Gov. accordingly considered it vital to resist' (an Agreement of Mutual Assistance was signed with Poland on Aug. 25). Prior to this, Hitler, in April, had denounced the Anglo-Ger. Naval Agreements on the pretext that Great Britain and other Powers were pursuing a policy of 'encircling' Germany. Chamberlain had now abandoned his policy of appeasement and Britain began to rearm in earnest. A ministry of supply was formed and a Conscription Bill passed. Abroad, the Brit. Gov. gave unilateral guarantees to Rumania and Greece, and concluded a treaty with Turkey for mutual assistance. On May 23, 1939, a treaty of military alliance was concluded between Germany and Italy. From the menacing note in Hitler's oratory it was becoming clear that the next attack was to be on Poland, a country to which it would be geographically impossible for Great Britain and France to send direct help; hence an attempt was made to bring Russia into the 'peace front', a front which the Nazi Gov. always distorted into the fiction of encirclement, and negotiations with this object went on in Moscow during most of the summer. Meanwhile the Nazi leaders launched a furious campaign of threats and propaganda, demanding that Poland yield up Danzig as a Free City within the framework of the Reich and that Germany should receive a route and railway with extra-territorial status through the Polish Corridor (*q.v.*) in exchange for a 25-year pact of non-aggression and a recognition of the existing Ger.-Polish boundaries as 'ultimate.' The Polish Gov. replied that these proposals were a demand for 'unilateral concessions' and that no discussions could be of any value unless Germany's intentions were peaceful and their procedure conducted by peaceful methods. In Danzig the local situation grew tense in June with the formation there of a Ger. *Freikorps*. The Polish Gov. maintained a restrained attitude in the face of Lord Halifax's suggestion for

a joint consultation between Great Britain, France, and Poland on the co-ordination of their plans. There is no doubt that Hitler was convinced that Great Britain would never fight over Danzig. Furthermore, Germany shrewdly discounted the factor of Russian help to Poland.

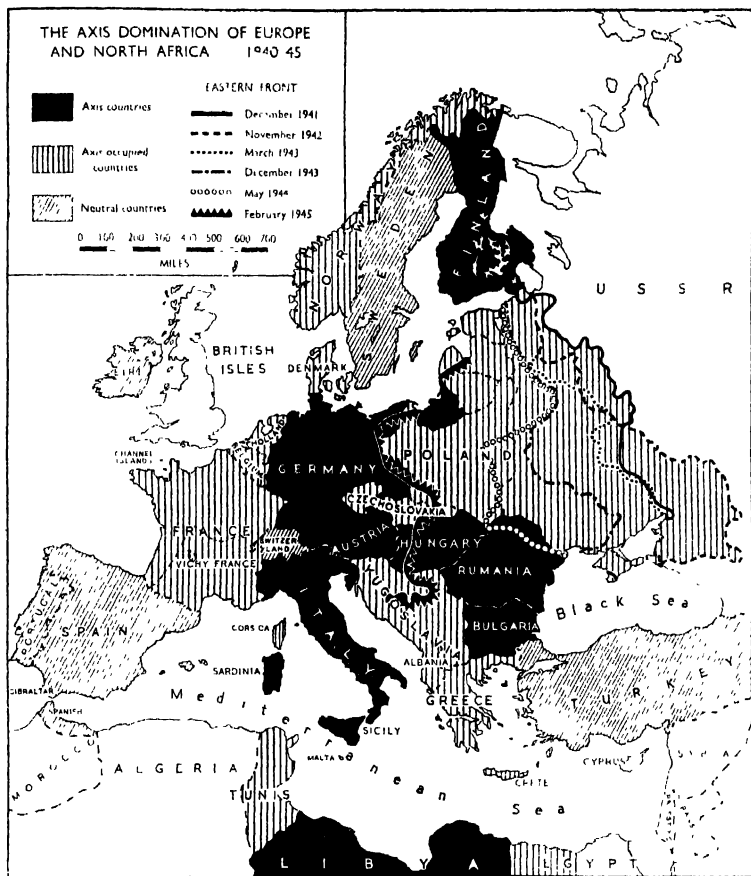
The most startling development in the international situation after this was the announcement that von Ribbentrop (*q.v.*), foreign minister, had gone to Moscow to sign a non-aggression pact with the Soviet Gov. Chamberlain sent a personal letter to Hitler stating that 'whatever might prove to be the nature of the Ger.-Soviet Agreement, it could not alter Great Britain's obligation.' If its more specific provisions were kept secret, events soon revealed that Stalin and Hitler had in effect concluded a bargain whereby Russia was to have the Baltic States, and that Poland should be partitioned between them. Still later, Germany acquiesced in the Russian seizure of part of Finland.

The Ger. reply to the letter was given to the Brit. ambas. on Aug. 23. Hitler stated that the Brit. promise to assist Poland would make no difference to the determination of the Reich to safeguard Ger. interests, and that the precautionary Brit. military measures announced in the Prime Minister's letter of Aug. 22nd, would be followed by the mobilisation of the Ger. forces. In order to gain a strategic advantage over Poland, Hitler resorted to a characteristic piece of diplomatic jugglery. Having refused to guarantee a negotiated settlement with Poland on the ground that 'Polish provocation might at any moment render German intervention to protect German nationals inevitable' (Aug. 25), four days later he told Henderson that he was prepared to accept the Brit. proposal for direct Ger.-Polish negotiations, but counted on the arrival of a Polish plenipotentiary by Aug. 30th, to which the Brit. ambas. retorted that the Ger. answer 'sounded like an ultimatum.' In short, without giving the Polish Gov. the slightest opportunity of making contact with Berlin, the Ger. Gov. then broadcast their 'proposals' together with the statement that they regarded them as having been rejected. The proposals had in fact never been communicated to the Polish Gov., and all means of communication between the Polish ambas. in Berlin and the Polish Gov. had been cut off. On Sept. 1, Forster, the Ger. nominee in Danzig, announced in a proclamation to the people of Danzig the reunion of Danzig with the Reich, and on the same day the Ger. armies invaded Poland. Two days later Mr. Chamberlain announced in the House of Commons that Great Britain was at war with Germany. France declared war simultaneously. The invasion of Poland, therefore, was the immediate cause of the war between the Allies and Germany. The general aim of National Socialist Germany was now plainly discernible over many years. That aim, possibly

that of Germany even before the advent of Hitler was simply and solely the renewal of Ger. imperialism along its previous lines, and the reversal of the Ger. defeat of 1918. The whole purpose of Nazi terrorism was to make the nation internally strong for war, inasmuch as in the Nazi theory the disaster of 1918 was due solely to faulty leadership and to the disintegrating influence of Jews and Socialists. Hence the forcible removal of all potential opponents and the subjection of the nation to a rigid discipline. Ger. imperialism now appeared under the banner of 'Lebensraum' (see further under 'MEIN KAMPF'), but its objects were much the same as under the Empire—European hegemony, and later, *Weltmacht* or world domination.

*German Invasion of Poland, September 1939.*—Secured against attack from the E., Hitler was free to move against Poland. On Sept. 1, 1939, without declaring war, Hitler sent his army into Poland, and that date is commonly regarded as the beginning of the Second World War. On Sept. 3, Great Britain and France declared war on Germany. The Ger. invasion of Poland was Europe's first experience of the *Blitzkrieg* methods, and in addition Poland tried to defend her strategically indefensible W. border. Warsaw was bombed by over 2000 Ger. aircraft; the W. half of the country was overrun by 54 Ger. divs., against which the Poles could oppose only twenty-two divs. of infantry and seven brigades of cavalry. They had only two tank brigades, few anti-aircraft or anti-tank guns, no armour, and only a horse-drawn supply service. Germany had seven armoured and seven motorised divs. Against Germany's 2000 aircraft Poland had 377; and the bombing of Polish airfields, before any actual invasion, destroyed the Polish machines on the ground. In a very short time the Gers. obtained complete mastery of the air, which enabled them to destroy communications and very soon to reduce the well-organised and brave Polish Army to a mob of disconnected units. The Polish Gov. then left Warsaw and the remnants of the army tried to hold a line on the riv. covering the cap. But a further complication was introduced by the invasion forces of Russia acting evidently under the new Ger.-Soviet Treaty. Attacked simultaneously in front and in rear a speedy Polish collapse was inevitable. The Polish Gov. crossed into Rumania on Sept. 17. Warsaw was bombed into surrender, and the partition of the unhappy country soon followed, together with the beginning of the Ger. exploitation and dispersal of the Polish nation.

*U-Bont Warfare begins, Sept.-Oct. 1939.*—Immediately on the outbreak of war Canada, Australia, New Zealand, and S. Africa ranged themselves beside Great Britain. Among the Commonwealth countries, only Eire remained neutral. In the six months following the collapse of Poland the only serious fighting occurred at sea, where the Gers. began



U-boat warfare on the day war was declared and on Sept. 4 sank the liner *Athenia* without warning. On Sept. 17 a U-boat sank the aircraft carrier *Courageous*, while on Oct. 14 another U-boat penetrated Scapa Flow and sank the battleship *Royal Oak* at her anchorage. Fortunately on the outbreak of war, Churchill, who had been excluded from office since 1929, was appointed First Lord of the Admiralty and under his vigorous administration, the Royal Navy soon had the measure (for the time being) of the U-boats at this early stage of the war. The most conspicuous success of the Allies at sea at this date was the battle of the R. Plate and the enforced scuttling of the Ger. pocket battleship *Admiral Graf Spee* (q.v.), and the fitting of ships with 'de-gaussing' girdles which rendered the Ger. magnetic mines almost ineffective.

*British Expeditionary Force in France 1939.*—Meanwhile the Brit. Expeditionary Force (B.E.F.) under Lord Gort (q.v.), was sent to the aid of the Fr. Army under Gen. Gamelin (q.v.), and took over a section of the Franco-Belgian frontier with Arras as headquarters and spent the winter in fortifying a position N. of the defences of the Maginot Line. The B.E.F. comprised by winter only two corps of three divs. each, together with a Fighter Wing and a Bomber-Reconnaissance Wing and an independent Advanced Air Striking Force. During the Polish invasion the Fr. forces made desultory attacks on the Ger. 'West Wall' (q.v.), notably around Saarbrücken; but, generally speaking, the W. Front was quiescent throughout the winter. Thus, apart from the bombing of naval objectives on either side, nothing happened on the W. Front before the

spring of 1940, a period of inactivity which earned the satiric description of 'the phoney war.'

**Russian Invasion of Finland.—German Invasion of Denmark and Norway: Nov. 1939–April 1940.**—After the partition of Poland, Russia sought to implement the secret clauses of the pact with Hitler by obtaining possession of the Baltic States. Finland, however, refused to submit, and on Nov. 30 the Russians invaded that country. In the opening stages the Finns prevailed against their mighty neighbour and it seemed at one time as if the Brit. and Fr. might render aid to Finland, contingently on securing Scandinavian support generally. This support, however, was not forthcoming and in the result Russia's overwhelming forces prevailed and Finland, by the treaty of Moscow (March 13, 1940), yielded to Russian demands and the small expeditionary force prepared by the Allies was dispersed. Meanwhile, on Feb. 16, the Brit. destroyer *Cossack* rescued 299 Brit. merchant seamen from the Ger. prison ship *Altmark* in Norwegian waters where, very soon, the world was to be given yet another example of long-prepared Ger. aggression. For on April 9, 1940, Hitler launched his *Blitzkrieg* against Denmark and Norway. (See NORWAY AND DENMARK, GERMAN INVASION OF (1940)). Denmark was overrun without opposition, and the prin. ports and airfields of Norway were captured on the first day. Two small Allied forces sent to Norway were foredoomed. Events outside Norway were destined soon to compel their evacuation. The lesson of air power was again exemplified by the campaign in Norway, for it was by the instrumentality of this arm that the Gers. safely crossed the Skagerrak despite the presence of the Brit. Home Fleet which was lying off Bergen. The Allies were powerless in Norway though, in the extreme N., at Narvik, Brit. ships destroyed the local Ger. warships and supply vessels and an allied force captured Narvik itself; but, after the Fr. capitulation, the tn. was evacuated. After the withdrawal of the two small allied forces, the king of Norway and his gov. settled in Britain, being the first of many allied gov. to carry on the uphill struggle from that country. Following the brief inglorious Allied campaign in Norway, Churchill replaced Chamberlain as Brit. Prime Minister. The new gov. was joined by the leaders of other political parties. It was no time for disunity, for on the day Churchill assumed the reins of gov. Germany struck at Holland and Belgium. (For details of the campaigns in the Low Countries and France, 1940, see WESTERN FRONT IN THE SECOND WORLD WAR)

**German Invasion of the Low Countries. May 1940.**—Holland was crushed in a few days. The Belgians appealed for Allied support, and the Fr. and Brit. armies on the Belgian frontier wheeled N.E. to the Dyke, as the Gers. intended they should. The Gers. used parachutists and 'fifth column' aid; they were soon able to attack Rotterdam and capture

the vital Moerdijk bridges in the heart of Holland. The position of the Dutch Army was hopeless after this loss, but their surrender was hastened by the bombing in daylight of the centre of Rotterdam in which over 900 inhab. were killed, and the centre of the tn. very heavily damaged. Queen Wilhelmina and her gov. however, succeeded in escaping to London. The defence of Belgium fared no better. The early loss of the bridges over the Albert Canal prejudiced the forward line of the Belgians and the main line, on which were also the Brit. and Fr. troops and which ran through Antwerp, Louvain, and Namur, was soon gravely compromised by the Gers. striking at Sedan, the hinge of the allied wheel. Faced by this threat Gen. Gamelin, commander-in-chief of the allied forces, fell back on the line of the Scheidt while Ger. armour was pouring through a gap in the Fr. Ninth Army between Sedan and Mézières where there was no Maginot Line. This irruption separated the B.E.F. and the Fr. N. armies from the rest of the allied forces on the W. Front and the Gers. now wheeled again and made a dash for the Channel coast in the direction of Boulogne. The Belgian Army's supplies were gone, and on May 28 King Leopold capitulated to the Gers.

**Allied withdrawal to Dunkirk.—Germans cross the Seine and enter Paris.—France capitulates.—Mussolini declares war, May–June 1940.**—The encircled allied armies withdrew to the Dunkirk beachhead and on May 26 the historic evacuation began. While this evacuation was in progress, Gen. Weygand, who had superseded Gamelin, tried to re-form the Fr. armies on the Somme-Aisne line; but nothing could stop the onrush of Ger. armour, which crossed the Seine on June 10 near Rouen. In spite of her own desperate position, Britain sent her only two formed divs., the 52nd Lowland and 1st Canadian, to France, but they were withdrawn soon afterwards. The 51st Highland Division and 1st Armoured Division were still behind the Somme, forming a part of the Tenth Fr. Army, which was trying to hold the line of the riv. All these Brit. troops put up a gallant defence; their losses in killed and prisoners were extremely heavy. Eventually the remnants of these Brit. forces were evacuated from St. Valéry and Le Havre. With France tottering, Mussolini declared war and attacked France from the S. On June 14 the Gers. entered Paris. The French Gov. went to Bordeaux, where Reynaud gave place to a Létain-Weygand Gov. which at once sued for an armistice. On June 21 at Compiègne, Fr. delegates signed the armistice. It is agreed that Hitler's best chance of defeating England was in these weeks. (On Ger. plans to invade Britain, see under GREAT BRITAIN; and OPERATION SEALION).

#### BRITAIN STANDS ALONE.

**The Battle of Britain.—French warships engaged by British Fleet: Aug.–Oct. 1940.**—Britain now stood alone against the Axis (see AXIS, ROME-BERLIN). The coun-

try was without weapons; the equipped troops available for defence numbered hardly more than one div.; Spitfires and heavy anti-aircraft guns were scarce before mid-summer. Coastal defences were, however, soon organised, and the Local Defence Volunteers, later called the Home Guard (*q.v.*) was already being formed. When the Battle of Britain (*q.v.*) began, the R.A.F. were badly outnumbered, but they made up for this deficiency by the quality of their aircraft and pilots. Between July 10 and the end of Oct., Brit. fighters brought down hundreds of Ger. raiders. Britain claimed at the time that these losses amounted to 2698 aircraft; post-war examination of Ger. records modified this claim to 1733. These losses were too much for the Luftwaffe and daylight raids, the recognised preliminary of the *Blitzkrieg*, were abandoned for night raids, for which the Gers now had more trained night-bombers and during the following year London, Coventry, Hull, Plymouth, Southampton, and other big tns. were severely damaged.

The surrender of France created more problems for Britain. Only Gen. de Gaulle (*q.v.*) and the small band of 'Free Frenchmen' decided to fight on from Britain. Most urgent of the problems was that of the Fr. warships in Brit., Egyptian, and Fr. N. African ports. Those in Brit. ports and at Alexandria were immobilised and those at Oran and Dakar (*q.v.*) were disabled by units of the Brit. Fleet. Hitler could now draw his submarine blockade tighter, for he was in possession of all the ports of W. Europe from the N. Cape to the Pyrenees. The Royal Navy's efforts to break it met with varying success in this and the ensuing years, but they never failed (see NAVAL OPERATIONS IN SECOND WORLD WAR); the menace of a new magnetic mine was quickly overcome, and the establishment of enemy naval and air bases across the Allied traffic lanes was prevented by the Brit. occupation of Iceland and Faroes.

*The Lesson of Sea Power.—The Berlin Pact, Sept. 1940.*—Hitler had supreme confidence in the superiority of armies over sea-power. Hence even if Britain was still undefeated and receiving aid from another great sea-power, America, he thought that time was on his side and that, provided Germany and Italy could overwhelm continental Europe and the Middle East (*q.v.*), their supplies of raw materials, being independent of sea transport, were assured and they could turn round at leisure and overwhelm the W. democracies. Meanwhile, Hitler openly favoured Japan and, while not yet ostensibly turning his back on Russia, was plotting an invasion. The Ten Year Mutual Assistance Pact was signed in Berlin on Sept. 27, 1940, by Germany, Italy, and Japan, the last named thereby entering the Axis. By recognising Japan's leadership of the 'New Order' in E. Asia as a *quid pro quo* for Japan's recognition of the leadership of Germany and Italy of a New Order (*q.v.*) in Europe the Axis was pursuing a long-range policy

against both America and Russia. Moscow had (Jan.-March 1941) been warned by the Amer. Gov. that it was Hitler's intention to invade Russia, but the Russian gov. cautiously declared that the Berlin Pact did not affect the relations of Russia with any of the signatories and that the Russo-Ger. Pact of 1939 remained unchanged. Meanwhile the chief military operations were in the Mediterranean, where the defection of France and the treacherous policy of Mussolini placed Britain in a most awkward situation.

*Fighting in North Africa, Dec. 1940-Aug. 1941.*—Mussolini, confident that the Axis had virtually won the war, had declared war on both Britain and France. Its troops, numbering 300,000, led by Graziani (*q.v.*) crossed the Egyptian frontier but were harassed by Brit. patrols and eventually held at Sidi Barrani, until on Dec. 9, Gen. Wavell (*q.v.*) reinforced by Indians, Australians, and New Zealanders, made the first of three great thrusts in the W. Desert. He drove the It. not only out of Egypt but out of Cyrenaica. His subsequent retreat was not due to any fault of strategy. Two drafts upon his small army weakened him. The first was for Greece, against which country Mussolini, using Albania as a base, had launched an invasion in Oct.; and the second was for the brilliant campaign of Nov. 1940 to June 1941 against the duke of Aosta which destroyed Mussolini's E. African Empire and freed Abyssinia. While the Western Desert Force was thus weakened, the It. troops of Graziani were reinforced by Ger. troops and Ger. aircraft based on Sicily. Wavell could not resist the counter-thrust and was driven back again to the Egyptian frontier (April 1941). He left behind a force that held Tobruk until Gen. Auchinleck (*q.v.*) who succeeded him, made his attack in Nov. 1941. That too was brilliantly executed but it failed, as Wavell's thrust had failed, before El Aghella. Retreating from El Aghella, Auchinleck stood for four months at Gazala; but Rommel (*q.v.*), creator of the Ger. Afrika Korps, mustering greater strength, overran the position, captured Tobruk, and drove him back to El Alamein (May-Aug. 1942). (See UNDER AFRICA, NORTH, SECOND WORLD WAR, CAMPAIGNS IN.)

*Italian Invasion of Greece.—Italian Fleet crippled at Taranto: Oct. 1940-June 1941.*—Reverting to events in 1940, the Gks. offered a most spirited and effective resistance to the It. invaders. But Hitler helped his It. ally in the Balkans as well as in Africa. He secured the aid of Rumania and Bulgaria. The Gks. appealed to Britain, who sent an expeditionary force made up partly of troops from Gen. Wavell's army. Here again, however, in the Mediterranean sea-power made its influence felt when on Nov. 11, 1940, Adm. Cunningham (*q.v.*) dealt brilliantly with the It. Fleet at Taranto, half the enemy's battle fleet being torpedoed by Brit. naval aircraft. This remarkable victory at one blow restored

for a time naval supremacy in the Mediterranean to the Brit. fleet. It was sea-power again which enabled the Brit. transports to land troops in Greece and to evacuate them. The Brit. force in Greece was no more than a token, comprising one Australian and one New Zealand infantry div. and a Brit. armoured brigade, and the Allies were soon defeated by the overwhelming superior Ger. forces. The Gers., advancing S., called upon Yugoslavia to align herself with the Axis. The regent, Prince Paul, acquiesced but was driven out of office by King Peter; the Yugoslavs continued resistance under Mihailovitch (q.v.) and Tito (q.v.) and eventually triumphed. The defeat of the Greco-Brit. forces was partly relieved by the brilliant night victory of Adm. Cunningham off Cape Matapan (q.v.) on March 28, 1941; but, though this victory over the It. Navy and that at Taranto enabled the troops to be ferried to Crete, Ger. aircraft inflicted heavy losses on Brit. destroyers, artillery, and transport. The Brit. forces then tried to hold Crete but fared no better there than in Greece, and they were evacuated, with severe losses in men and material, in June 1941. *See further under CRETE, THE BATTLE OF; and GREECE, SECOND WORLD WAR CAMPAIGN IN (1941).*

*American Lend-Lease, March 1941.*—In 1939 America's attitude was so strictly neutral that there was a law on the statute book prohibiting the sale of arms to any belligerent. From this isolationist position, however, the country, under Roosevelt's lead, gradually moved into that of 'the arsenal of democracy,' and the embargo gave place to a 'cash and carry system.' In Sept. 1940 America transferred to Britain 50 destroyers in exchange for the lease of certain naval and air bases. In March 1941 the Lend-Lease Bill became law (*see LEND-LEASE*).

*British action in Syria and Iraq, April-July 1941.*—Britain now had a third enemy in the shape of Vichy France. (*See FRANCE, History and Pétain, HENRI*) Pétain's Gov. allowed Germany the use of her airfields in Syria for the support of a rising in Iraq (q.v.); and when, after its suppression, Brit. and Free Fr. troops entered Syria to prevent other like action, Vichy ordered the troops in the country to resist. They were overcome, however, and Syria passed into the control of the Free Fr. (July, 1941).

#### THE CONFLICT BECOMES WORLD-WIDE.

*Bismarck sunk.—Hitler invades Russia: May-June 1941.*—In the Atlantic Germany's last attempt to support her submarine campaign by the use of commerce raiders was crushed by the sinking of the *Bismarck* (q.v.), on May 27. This notable defeat emphasised Germany's need to make much more use of her armies if she hoped to avoid the stranglehold of Brit. sea-power. Though a great pincer movement through Turkey and N. Africa with the Middle E. oilfields as the objective was a possible Ger. plan, Hitler had decided on the invasion of Russia, but against the soundest military advice. This

was eventually launched on June 22, 1941, with the aid also of Hungarian, other Balkan, and Finnish troops. (*See EASTERN FRONT, OR RUSSO-GERMAN CAMPAIGNS IN SECOND WORLD WAR.*)

*German victories in Russia, June-Nov. 1941.*—The Gers. and their satellite troops swept forward to Leningrad (q.v.), which they besieged but never took. Their forces overran the agric. Ukraine and the industrial Don Basin. They came within reach of Moscow itself. These gains were the more impressive from the fact that the Gers. for the first time were fighting a Power which was prepared for them, both in mobilised man-power and in mass production. But the Gers. were superior in the new tactics and strategy of the *Blitzkrieg* and this experience might conceivably have prevailed but for Russian tenacity and the Russian climate. The buffer States (the three Baltic States, Bessarabia, and E. Poland) which Stalin had hoped would effectively cushion the first shock of the Ger. impact, had been wrenched away from his grasp in fierce battles. The flower of the Russian army disappeared in the great battles around Bialystok, Kiev, Kharkov, and Rostov-on-Don, soon fell to the triumphant Ger. armies. The Russians had not yet mastered the art of defence in depth. They followed a desperate 'scorched earth' policy and fought with extraordinary heroism. Their losses and sufferings were enormous, but they never ceased their dogged resistance. The Gers. relied largely on superior armour and on aircraft, and the forces employed on both sides were beyond precedent in the records of warfare. Following their great losses the Russians had to rely for supplies partly on the war factories of the Urals, to which much plant had been transferred, and partly on lavish shipments from Britain and America, which reached them from Murmansk and from Persia after the deposition of the pro-Nazi Shah Pahlavi in Aug. 1941 by Brit. and Russian forces.

*Japan enters the War.—British battleships sunk.—Fall of Singapore, Dec. 1941-June 1942.*—The struggle now swiftly developed into a world conflagration. Churchill's broadcast of June 22 had certainly enlisted Amer. sympathy for Russia, but the latter's evident plight also excited Jap. acquisitive instincts. With Vichy's concurrence, Japan had already seized Fr. Indo-China as a jumping-off ground for their projected invasion of Burma and Brit. Malaya. (*See PACIFIC CAMPAIGNS, OR FAR EASTERN FRONT IN SECOND WORLD WAR.*) On Aug. 14, Churchill and President Roosevelt met on the Atlantic on a warship and signed the Atlantic Charter (q.v.), a gesture which irrevocably linked together the fortunes of the two great W. democracies. On Dec. 7, while a Jap. mission was negotiating in Washington, Jap. carrier-borne aircraft suddenly bombed Pearl Harbour (q.v.) inflicting serious damage on the Amer. warships there. On the same date Jap. aircraft attacked every Amer. and Brit. E. base within reach.



Both Japan and Germany then declared war on America. On Dec. 10, Jap. aircraft torpedoed and sank the Brit. battleships *Prince of Wales* and *Repulse* off the coast of Brit. Malaya, and so deprived Britain of the command of the sea in the E., this painful loss being due to the ships venturing into the gulf of Siam without fighter escort. Every blow of the Jap. against Brit., Amer., and Dutch bases in the S. Pacific found its mark; allied troops fought heroically but hopelessly. Manila fell on Jan. 3, 1942, and Hong Kong on Dec. 25, 1941. Singapore fell on Feb. 15, 1942, the evacuation of more than a handful was impossible; most of the newly landed troops were captured by the Jap., who soon invaded and occupied Burma. The virtual elimination of the Brit., Dutch, and Amer. warships in the Java Sea sealed the fate of the Dutch E. Indies. By the spring of 1942 Japan stood on the E. frontier of India and at the gateway of Australia and held the whole semicircular archipelago between, with the exception of New Guinea S. of the Owen Stanley Range. But Japan's thrust had spent itself, and further expansion westward was thwarted by the Brit. occupation of Madagascar (May 5, 1942). Attempts at expansion eastward were smashed in the battles of the Coral Sea (May 4-8), in which the issue was decided in the air, and of Midway Is. (June 4-6), which broke the spearhead of Jap. naval and air striking power.

*British reverses of 1941-42.*—Britain was outnumbered by the sea, land, and air forces of Japan throughout the Far E. theatre. In the words of Churchill, 'from San Francisco to Aden or Capetown there was no surface fleet capable of fighting a general action with the navy of Japan.' A further stroke came on Dec. 19, 1941, when the *Valiant* and *Queen Elizabeth* were seriously damaged by 11. limpet bombs in the harbour of Alexandria. Thus Britain had no longer any battle squadron in the Mediterranean. The sea defence of the Nile Valley was confined to submarine and defence flotillas, with a few cruisers and shore-based air forces. This necessitated the transfer of Brit. shore-based torpedo-carrying aircraft to the N. African shore, from the S. and S.E. coasts of England, where they were soon to be needed. In the escape of the *Scharnhorst* and *Gneisenau* from Brest. It was not felt that the Jap. would derive great advantages by invading Australia in force since thus they would commit themselves to a very formidable campaign at a great distance from home, but Japan certainly had the ability to overrun a large part of India, take Calcutta and Madras, and make 'very cruel air raids upon defenceless Indian cities.' However, if the Brit. were anxious about the sea, the enemy must be anxious about the air, for the great flood of Amer. reinforcements was soon to give the Allies superiority in numbers.

*Japanese invasion of the Southern Pacific and Burma.* Jan. 1942-May 1943.—

Meanwhile the Amers. were employing great naval and air forces in the Pacific against Japan. Here Jap. strategy in 1942 was to work from one captured point on the outer is. to another until they had isolated Java, the centre of resistance. They pressed these operations as rapidly as possible here and in the Pacific is. further E., so that an allied naval counter-offensive, whether based on India or Australia, would be confronted by a long chain of is. well supplied with airfields behind which their fleet could await attack. Not satisfied with their impressive conquests throughout 1942 the Jap. extended their flanks westward into Burma and eastward to New Guinea and the Solomons. Invading Burma from Siam, which latter country had declared war on Great Britain and America (Jan. 25) they took Moulmein (Jan. 31), crossed the Salween and Sittang rivs., and compelled the Brit. to abandon Rangoon (March 8). The Brit. forces, commanded by Gen. Sir Harold Alexander (q.v.), retreated up the Irrawaddy and Sittang, receiving Chinese reinforcements. But Jap. superiority in men and aircraft made the defence of Upper Burma impossible and on April 29 the defeat of the Chinese gave Lashio to the enemy. The Brit. evacuated Mandalay on May 1, and a fortnight later trekked miserably into India, weaponless and weary, followed later by Gen. Stilwell's Chinese forces. (See BURMA, SECOND WORLD WAR, CAMPAIGNS IN.)

*Moscow saved.—Germans take Crimea.—Siege of Stalingrad: Dec. 1941-Oct. 1942.*—Meanwhile in Russia, the severe winter of 1941-42 brought a great change. The Gers. were no match for the Russians in winter campaigning. Zhukov, issuing from Moscow, raised the siege of the Russian cap. and the Gers. were within an ace of repeating the disaster which befell Napoleon in 1812. The Ger. troops were steadily forced back but maintained 'hedgehog' and 'bolt positions' which were intended to serve as springboards for their offensive of the next year. Then, at a critical moment, the Ger. High Command divided their forces: one portion was ordered to strike S. at the Caucasian oilfields and the other E. to besiege Stalingrad. Meanwhile Leningrad, though reinvigorated across the ice-bound Lake Ladoga, was still suffering serious losses from the Ger. siege artillery. The Gers. had sustained a severe shock in the winter before Moscow, but with the thaw they had reassessed themselves. The Russian anticipated the Ger. spring offensive by a strong attack in the Kharkov region and a long drawn-out struggle ensued (May-June 1942), but they lost Sevastopol and the rest of the Crimea early in July, in the great Ger. offensive which began on a 200-m. front towards the Don. By Oct. the Gers. appeared to be in the ascendant—their forces closely besieging Stalingrad, and also advancing towards the Malkop oilfields. No less striking were the apparent victories in N. Africa. Wavell's forces had been driven back to the Egyptian

border early in 1941; soon afterwards he was succeeded by Gen. Auchinleck, who relieved Tobruk and retook Benghazi (Dec. 1941). But (as noted already) his attack failed at El Agheila. Some months later Rommel, now commanding both Ger. and It. forces, defeated the Brit. force, which retreated into Egypt to El Alamein (July, 1942).

**THE TURN OF THE TIDE.**—*Battle of El Alamein.*—*Allies land in North Africa: Nov. 1912-May 1913.*—It may be said that Nov. 1942 marked the high tide and the turn of Germany's fortunes. Various factors were co-operating to destroy their illusions of world conquest.

of the great Ger. cities. The turn of the tide came swiftly. In Aug. 1942 Gen. Montgomery was appointed to the command of the Eighth Army (q.v.), while Gen. Alexander replaced Gen. Auchinleck as commander-in-chief in the Middle East. On Oct. 23-24, 1942, the Eighth Army lunged forward under its new leader in a third thrust. It was equipped with a new Amer. tank, the 'General Sherman,' which could knock out the Ger. Mark IV Special. Alexander's move was timed to precede the landings of Brit. and Amer. armies under Gen. Eisenhower (q.v.) at Casablanca, Oran, and Algiers. The thrust hurled Rommel



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THE TURN OF THE TIDE: SOUTH OF EL ALAMEIN, NEAR BIR GABALLA, AUGUST 20, 1942

Lieutenant-General Montgomery points out various features while talking with officers of the 22nd Armour Brigade. On General Montgomery's right is Lieutenant-General Horrocks, and on his left, Bugadier Roberts, of the 22nd Armoured Brigade.

Thus, while it is true that, when America entered the war, there was an ominous rise in shipping losses due to the operations of U-boats in Amer. waters and that the menace of these terrible losses was felt throughout 1912; yet in 1913 this threat to Brit. food and other supplies gradually began to be completely mastered. It was now, too, that Brit. factories were mass-producing bombers which were destined in the ensuing two years to play a decisive part in the whole issue of the war, when, in conjunction with Amer. Flying Fortresses (q.v.) and Liberators, the Brit. Lancasters, Halifaxes, and others, destroyed Ger. industrial plants and heavily damaged many

back to El Mareth on the Tunis-Tripoli frontier, and Montgomery's army met the forces of Eisenhower. The landings in Fr. N. Africa (Nov. 8) constituted the greatest amphibious operation undertaken up to that time. Hitler sent an army under Gen. von Arnim into Tunisia with orders to hold the country as a bridgehead for further operations in Africa. The result was that this, as well as Rommel's famous Afrika Korps, were all routed or taken prisoners by May 12. On entering Algeria, the Allies made use of Adm. Darlan (q.v.), but he was assassinated soon afterwards. Free Fr. Forces, earning the confidence that was denied them by their fellow-countrymen,

helped heroically in clearing N. Africa, particularly in their brilliant action at Bir el Hakim in the W. Desert.

*The Casablanca Agreement, Jan. 1943.*—Churchill and Roosevelt met at Casablanca to formulate terms on which they would accept the surrender of the Axis nations, and they agreed that the surrender must be unconditional. It was decided that this surrender must be that of all three Axis nations and not of their dictators, with whom the Allies had previously stated that they would never negotiate. Russia was not represented at this conference in view ostensibly of Stalin's preoccupations in Russia.

*Russian victory at Stalingrad, Nov. 1942–April 1943.*—Within a fortnight of the Allied landings in N. Africa, Hitler received another tremendous rebuff, in Russia. Stalin's winter offensive, conducted by generals like Zhukov, Konev, Petrov, Malinowsky, and others who had now well learned the lessons of modern strategy and tactics with armour and aircraft, compelled the Gers. under von Manstein to withdraw from the coveted Caucasus, cut off the Sixth Ger. Army besieging Stalingrad, and completely destroyed it. The Russian counter-offensive which thus saved the remains of Stalingrad and wiped out the tragic Army of von Paulus, was begun on Nov. 19. It was a strategic surprise in which the Gers. paid the penalty of deficient air reconnaissance. The Germans' main attempt to relieve the trapped army was by an advance from the S.W. up the railway through Kotelnikov. This advance was utterly crushed and following the isolation of the Don Bend, the Russians organised a great pincer movement on Rostov, one arm from Voronezh and the other from Kotelnikov. Fearing a second great encirclement the Ger. High Command ordered the Ger. army in the Caucasus to retreat. Their withdrawal was skillfully executed but it involved the abandonment of an immense grain-producing region and of the great oil-fields. The Russian activity was not wholly absorbed in the S. The Russian capture in Jan. of Veliky Luki, the pivot of the Ger. fronts towards Moscow and Leningrad, was the initial step in the important phase of reducing the Ger. so-called 'hedgehogs,' such as the nearest to Moscow, Rzhev, which fell on March 3, and Vyasma, on the Warsaw-Moscow railway, which they took on March 12. Moreover the surrender of the Ger. Sixth Army at Stalingrad released a great Russian army in the S. which at once had a profound effect on operations in S. Russia. Kursk being taken on Feb. 8, Rostov on Feb. 14, and Kharkov on Feb. 16. The Russians, however, then suffered a temporary reversal of fortune through a premature spring thaw, when they lost Kharkov and most of the Donetz Basin to a strong Ger. counter-offensive. This left the Gers., in April, in a favourable position for the resumption of an offensive in due season provided they were not forestalled by the extremely confident Russian generals.

*Axis surrender in Tunisia (May 1943):*—Axis resistance in N. Africa came to an end on May 13 when the It. commander-in-chief, Messe, ordered the whole force to surrender. Victory yielded the entire N. African coast, besides liberating Malta from further attacks and enabling Allied bombers to fly under lighter escort from one end of the Mediterranean to the other. Now that the Axis power in the Mediterranean was broken, Allied ships were no longer forced to take the long route round S. Africa.

*The Atlantic Battle.*—Promising as was the situation on land, the menace from the U-boats was still very serious, especially as the Gers. could produce the boats much more speedily than the Allies could hunt and sink them. Moreover, the Anglo-Amer. navies and convoys were greatly impeded by Kire's refusal to allow them to use the Irish ports which had been surrendered by Britain in 1938. Furthermore, Ger. aircraft from W. France could fly far into the Atlantic to transmit reports to the U-boat packs on the position of the convoys. Finally, radio-location, or radar (q.v.) was available to the Gers. through the Vichy Gov. of France, for the secret had been entrusted to France in the early stages of the war. The peril was therefore substantial, but constant and effective attacks were launched by the R.A.F. on U-boat pens: long-range Sunderland and Liberator planes roamed great distances in quest of the enemy craft; and Canadian corvettes, produced in great numbers, were valuable convoy escorts. It appears, however, that the turning-point in this great Atlantic struggle was the use of improved radar apparatus with which both surface ships and aircraft were now equipped, so that they could range over immense areas of the Atlantic. The U-boat packs were then reduced to a large area in the middle of the ocean, but the use of carrier-borne aircraft defeated them and the last phase came in Oct. 1943 when the Allies were allowed by Portugal to make use of bases in the Azores. Some sixty U-boats were destroyed between Aug. and Oct.

*Development of Allied Bomber Raids.*—The Anglo-Amer. bomber attacks on Ger. industrial centres were an integral factor in Germany's downfall. Their weight and effectiveness, small at first, increased gradually, especially after mid-1942, the first all-Amer. raid in Europe being that of Aug. 17, 1942. The gradual increase of loads was rendered possible by the power of the Brit. Lancaster machine which carried three the bomb-load of the earlier Amer. bombers, which, however, carried very powerful armament, though their armour was not very effective against A.A. In 1942 the bombs were increased in size from 2000 to 8000 lbs.; 12,000 lbs. were first used only in 1944 while 22,000 lb. bombs were used from March 1945. The remarkable 1000 bomber raids on Cologne, Essen, and Bremen, in May–June 1942 were not repeated because quality of machine and bomb-load and accuracy

of bombing were of more importance than more numbers. In the course of the same year accuracy was much enhanced by the 'pathfinder' system of dropping guiding 'markers.' The Gers. had no effective answer to these attacks.

*Allied conquest of Sicily.—Collapse of Mussolini's Fascist Government: June-July 1943.*—The sequel to the Axis defeat in Tunisia was the landing in Sicily two months after the surrender at Tunisia. In the two months' pause the Allies took the is. of Pantelleria and Lampedusa (June 11 and July 12) which gave bases for fighter cover to supplement that of Malta. This stage of the war was to be marked by two great amphibious operations which outshone that of N. Africa. The 1914-18 War offers no adequate parallels to the brilliant raid on St. Nazaire (March 1942), or to the Dieppe raid (*q.v.*) carried out mainly by Canadian troops on Aug. 18-19, 1942. The latter raid was unsuccessful, but valuable lessons were learned, though even so, enough suitable landing-craft were available for 'D'-day only by diverting a number which it had been intended to use in Burma. Quantity, also, was as essential as quality and much was owed to Henry Kaiser's (*q.v.*) mass-production of shipping to replace lost mercantile tonnage. Great amphibious operations both in Europe and in the Pacific had to wait on the supply of these craft. Hence the pause between von Arnim's surrender and the invasion of Sicily and also the failure to expedite the campaign in Italy (where there was a military stalemate after the fall of Rome), by parallel operations in conjunction with Marshal Tito in Yugoslavia. The landings in Sicily, with fighter cover from Malta and Pantelleria, were made on the S. and E. coasts on July 10 by the Amer. Seventh and Brit. Eighth Armies, the latter being joined by a Canadian Div. The is. garrison was eleven It. coastal and field divs., and two Ger. armoured divs., one of which was armoured. The Gers., and some It. field divs., offered very stubborn resistance, and it was not until Aug. 5 that Catania was taken. The hardest fighting took place around Mount Etna. Messina fell on Aug. 17, but by an intensive use of flak the Gers. succeeded in moving most of their troops across the narrow strait to the It. mainland and only 7000 were captured; yet total Axis casualties were 165,000. The conquest of Sicily after four months of preparation and execution left too little time for the conquest of Italy during the remainder of the campaigning season. But the Allied landing caused the collapse of Mussolini and his Fascist gov. and he resigned (July 24) a fortnight after the invasion began. On July 26 he was put under arrest and replaced by Marshal Badoglio (*q.v.*), who, as executive head under the king, formed a new gov.

*Italian armistice.—Anglo-American landing at Salerno: Sept.-Dec. 1943.*—Badoglio openly pledged the continuance of It. support of the Axis, but soon afterwards he was secretly negotiating an

armistice with the Allies which was signed on Sept. 3, 1943, but not pub. until five days later. On the 3rd, the Brit. Eighth Army crossed from Sicily into Calabria and began a methodical advance up the Peninsula. The It. fleet for the most part succeeded in escaping to Malta and Alexandria. The Gers. evacuated Sardinia and were thrown out of Corsica. The It. divs. were, however, for the most part disarmed by the Gers. An airborne descent had been arranged for capturing the airfields round Rome, but the Gers. swiftly seized these before the descent could be made. Hence the Allies were not able to secure fighter protection for landings further N. from Calabria than Salerno and it was there, on Sept. 9, that the Fifth Army of mixed Brit. and Amer. troops was landed under the command of Gen. Mark Clark. The landing facilitated the northward advance of the Allies, but they were halted in terrible winter weather on the Ortona-Carigliano line. The Gers., having fallen back methodically, stabilised a very strong line right across a narrow part of the peninsula, which was the more formidable from the fact that it was backed by tortuous mt. tracks and rivers. N. of the line a great part of the It. people remained perforce under Axis rule. Thus, though the defection of Italy was a grievous blow to Germany, Hitler's advisers found palliatives. Hopes reposed by the Allies in Crete and the Dodecanese came to nothing, for attacks without air cover were futile; and in the Balkans as a whole the one useful result of the defeat of Italy was that Marshal Tito, now the leader of the Yugoslavs, further developed his remarkable organisation of successful resistance to the Gers. Meanwhile by a daring parachute coup Ger. units rescued the imprisoned Mussolini and took him to Hitler.

*Allied troops land at Anzio beachhead, Jan.-June 1944.*—Operations in Italy were held up by torrential seasonal rains but on Jan. 22, 1944 Allied troops were landed at the Anzio-Nettuno beachhead, though they failed to cut the Ger. lines of communications and had to hold on for four months before they were joined by the main Allied army. In this offensive, opened on May 12, rapid progress was made, and the Allies entered Rome on June 4 and at once continued their dogged advance up the peninsula.

*Teheran Conference—Nov.-Dec. 1943.*—The end of 1943 brought another series of Churchill's visits abroad; at Teheran the exact course of the war was mapped out as to its final phases, culminating in the complete overthrow of Germany and Japan. The dates of this series of conferences were: Cairo, Nov. 22-26; Teheran, Nov. 28-Dec. 1; and Cairo, Dec. 4-6. An omen of success for the following year was the sinking of the Ger. pocket battleship *Scharnhorst* on Dec. 26.

*Russians seize the initiative.—Kursk—Orël battles: June-Sept., 1943.*—The Gers., assuming that they could always prevail in summer, launched an elaborately prepared offensive against the Kursk-

Orel salient. After some days of heavy fighting the Gers. were defeated with huge losses in men and machines. Orel was retaken by the Russians on Aug. 4, and not many days later Kharkov was again recovered. The Russians now altered their whole strategy, from one of dogged but cramped defence to one of all-out attack and drive, and now broadened their offensive: in the Caucasus they took Taganrog on Aug. 30; from the Kharkov region, they seized Poltava on Sept. 23; still further N., near the heart of the whole front, they took the great rail-centre of Bryansk. Smolensk fell to them on Sept. 25.

*Battles of Dnieper Bend.—Odessa liberated.—Russians retake the Crimea: Oct. 1943–May 1944.*—Nothing could now stop the momentum of the remarkable Russian recovery and forward surge. They took Melitopol on Oct. 23 and proceeded to seal off the Crimea. There was very stiff resistance in the all-important Dnieper Bend, but on Nov. 6 the Russians retook Kiev, and Zhitomir a week later, though Gen. Vatutin had outrun his communications and the position had to be restored by Zhukov, saviour of Moscow. Strenuous and successful efforts were now made by the Russians to improve their whole position in the Leningrad area. Both Peterhof and Novgorod, for years the Ger. headquarters in the N., were now retaken. In Feb. 1944, following the capture of Nikopol and Krivoi Rog, the Ger. positions in the Dnieper Bend were eliminated. In the ensuing month, Russian armies crossed in succession the great rvs. of the S. Bug, the Dniester, and the Pruth. Odessa was liberated on April 10, but the historic fortress of Sevastopol was not regained until May 9, by which time the Gers. had suffered a loss in the Crimea alone of 110,000 killed or captured; nor were their losses in the Dnieper Bend any less.

*British success against U-boats.—Möhne and Eder Dams breached: Sept. 1943–March 1944.*—The Brit. campaign against U-boats showed increasing success, for by 1943 convoys were losing only 1 ship in 344 as against 1 in 181 in early 1911. Ger. surface ships also fared badly. The *Turpitz* was heavily damaged by Brit. midget submarines in Altenfjord (Sept. 1943); the *Scharnhorst* was sunk off the Norwegian coast in Dec. But another very important element in winning the supply battle was Anglo-Amer. bombing policy. Many great Rhineland cities were repeatedly and methodically bombed in the first half of 1943 and the Ruhr (*q.v.*) never recovered from the persistent onslaughts. Other outstanding events in strategic bombing warfare were the heavy damage inflicted on Hamburg (July 1943), the breaching of the Möhne and Eder dams (18 May, 1943), and the bombing of Berlin (*q.v.*) between Nov. 1943 and Feb. 1944; post-war investigations, however, have since led to criticism of both the extent and value of such attacks. The Amer. aircraft, too, had by now developed a formidable daylight bombing technique.

## THE WAR IN THE PACIFIC AND BURMA.

*Japanese capture New Guinea.—Americans retake Guadalcanar: Jan. 1942–Feb. 1943.*—In the S.W. Pacific the Jap. captured Rabaul (Jan. 22, 1942), which became their advanced base here, and landed in the Solomons (Jan. 23) and New Guinea (March 8). The first of sev. destructive air raids on Port Darwin (Feb. 19) increased Australian anxiety, which, however, was allayed by the appointment of Gen. MacArthur (*q.v.*) as Allied supreme commander in the S.W. Pacific. A successful raid on Tokyo and other cities by Amer. aircraft surprised the enemy, who took reprisals by executing sev. captured Amer. airmen. Early in May a concentration of transports and warships off Tulagi in the Solomons was a signal to attack. In the battle of the Coral Sea (May 4–8) an Amer. naval force under Adm. Fletcher defeated the enemy with severe loss. On June 3 a powerful Jap. fleet was sighted 700 m. W. of Midway Is., an Amer. outpost. Next day began a battle, fought on the same lines as that of the Coral Sea, in which island-based bombers and carrier-borne aircraft attacked the Jap. ships, while Jap. machines attacked the is. and the Amer. carriers; no surface ships met in combat. These two 'naval' victories marked the turn of the tide thus early in the Far E. war. (*See also NAVAL OPERATIONS IN SECOND WORLD WAR, Naval Operations, July–December, 1942.*) But despite these defeats the Japs. still endeavoured to extend their Pacific conquests by, *e.g.* occupying the Aleutians (*q.v.*), and advancing against Port Moresby (July 1942), in New Guinea. But on Aug. 7, the Amers. delivered a blow which began to reverse the whole progress of the Pacific war. This was the landing on Guadalcanar Is. in the Solomons of a strong force which captured an unfinished airfield of great importance and stormed and held the Jap. base. The Japs. made a series of intensive attempts to drive out the Amers. and landed troops under cover of heavy air support. The Amers. were equally pertinacious. After a series of very hard-fought actions off Cape Esperance (Oct. 11–12), off Santa Cruz Is. (Oct. 16–26), and off Guadalcanar itself in Nov. 12–15, where both sides employed battleships, the Amers. were solidly estab. on Guadalcanar, and on Feb. 9, 1943, organised Jap. resistance ended.

*Japanese held in New Guinea and in Burma: Aug. 1942–Mar. 1943.*—The Jap. attempt on Port Moresby failed owing to the defeat of a Jap. expeditionary force at Milne Bay (Aug. 31, 1942) and the failure of the Jap. army in New Guinea to overcome the doughty Australians only 30 m. distant from Port Moresby. This rebuff and the recapture of the is. of Buna, Gona, and Sananda, whose garrisons were all completely eliminated, put the Japs. thenceforward on the defensive in New Guinea; and the destruction of a large Jap. convoy in the Bismarck Sea (March 2–4), emphasised the Allied command of the sea.

*Madagascar occupied by the Allies.—***Salamaua and Lae taken: Nov. 1942–Sept. 1943.**—The conquest of Vichy-controlled Madagascar, which concluded with the armistice of Nov. 5, 1942, removed the danger of a Jap. descent on this important is. and strengthened the Brit. position in the Indian Ocean. Meanwhile in Burma the success of Gen. Orde Wingate's airborne and air-supplied force of Brit. and Indian troops (called 'Chindits') in raiding Jap. communications in Upper Burma showed the possibilities of a new military technique in this extremely formidable theatre of operations. In 1943 the Amers. destroyed the Japs. on Attu (May 11–30), and compelled them to evacuate Kiska in the Aleutians. In the S. fresh landings in the Solomons were followed by the conquest by Amer. and New Zealand troops of the is. of the New Georgia group in the Solomons (completed in Oct.). The landing of Australian forces in Huon Bay (Sept. 4), and a well-executed air-borne operation inland (Sept. 5) brought about the capture of Salamaua and Lae; and landings on Bougainville and New Britain further restricted enemy activities in this vast region.

*Allies' 'island-hopping' campaign in the Pacific.—Americans take Saipan: Nov. 1943–June 1944.*—Up to Nov., the Allied command had advanced from one captured vantage point to another, a method characterised as 'island-hopping.' But the great increase of the Amer. navy in ships and in carriers, the Allied superiority in the air, and improvements in the design of landing-craft, were all contributory factors which now enabled the High Command to concentrate on key points while by-passing less important positions which could be masked and put out of action by its spare strength in ships or aircraft. The struggle for the Gilbert Is., which ended on Nov. 20, showed that in many cases the Japs. were prepared literally to fight to the last man and this they did at Makin and Tarawa (Nov. 1943). The next westward jump of the Amers. was in late Jan., when they landed in the Marshall Is., taking the important airfield of Kwajalein—the first pre-1941 Jap. ter. taken in the war. It provided a base for bombing Truk, the greatest of Jap. Pacific bases. Resistance ended in the Marshall Is. by Feb. 4. Continuing a westward and northward course the Amers. reached the Marianas and in June captured the strong Jap. is. of Saipan, where for the first time they had won an air-base within long bombing range of the Jap. homeland and of the Philippines.

*Burmese Campaign.—British Army in the Chindwin Valley—Aug. 1943–Dec. 1944.*—Meanwhile a remarkable campaign was being fought in Burma. Help for China was the main preoccupation of the military discussions at the Quebec Conference, and in Aug. 1943 it was announced that it had been decided to form a separate S.-E. Asia Command for operations based on India and Ceylon against Japan. In Oct. Gen. Stilwell's

united Amer. and Chinese forces marched into the most northerly part of Burma together with ancillary troops to construct a road and pipe-line from Ledo to Yunnan. The progress made compelled the Japs. to attack the Brit. forces in Manipur State, on the Indo-Burmese border. This was a most critical move, for had it succeeded Stilwell's communications would have been cut. The Japs. also counterattacked in Arakan But in March, airborne troops under Gen. Wingate (who was accidentally killed on March 24, 1944), came down behind the Japs. opposing Stilwell and wrought havoc with their communications for three months. The Jap. counterattack in Arakan was defeated, and the Jap. Manipur offensive after appearing to be menacing for some time was brilliantly repulsed by the Fourteenth Army (G.C.) under Gen. Slim. In the N., Myitkyna was entered on May 19, while the Anglo-Chinese forces seized Mogaung (June 25). In the centre of the country the decision of Lord Mountbatten (G.C.) to fight through the monsoon period, brought the Fourteenth Army by Dec. into the Chindwin Valley. The remarkable use of aircraft for the reinforcement and supply of the Allied troops was the outstanding characteristic of this brilliant campaign.

*Americans invade Leyte Island in the Philippines: June Oct. 1944.*—The Jap. fleet tried vainly to relieve Saipan (June 19–20). The Amers., having captured the Marianas, were now bombing the Philippines. On Oct. 20, a large Amer. expeditionary force landed on Leyte Is. The Jap. fleet attacked in three widely separated but co-ordinated actions the Amer. Third and Seventh Fleets, but suffered heavy losses in ships and aircraft.

**OPENING OF THE WESTERN FRONT, AND THE COLLAPSE OF GERMANY.—Anglo-American Invasion of Normandy—June 1944.**—The landing in Normandy (see WESTERN FRONT IN SECOND WORLD WAR), was preceded by systematic bombing of Ger. industrial centres and air factories, even those sited far to the E., the destruction of communications with the coast, and of bridges, radar installations, airfields, and coastal defences. The Allies had devised landing craft which would put men and munitions directly on the beach and they towed across the Channel the sections of a pre-fabricated 'Mulberry' port (see ARROMANCHES). They had no need, therefore, to storm a port and landed between the riva, Orne and Vire on June 6, 1944. The method of attack took the Gers. by surprise: they expected attack on a port. The Brit. attracted strong resistance before Caen, thus helping the Amers. to break into the Cotentin Peninsula and capture Cherbourg. Some weeks of obstinate positional fighting ended in a double Allied advance—by the Amers. towards Le Mans and by the Canadians towards Falaise. When the Amers. thrust northwards to Argentan their thrust suddenly assumed the aspect of a vast enveloping movement. The whole Ger.

Army in Normandy, into which troops from the rest of France had been drawn during the preceding weeks, was enclosed in a narrow-mouthed pocket from which it could withdraw only under withering fire. Cherbourg fell on June 26, though long and heavy repair work was needed to make the port practicable. Even after this loss the Ger. High Command continued to cherish the illusion that they could stall hunt the invaders within an area too small for manoeuvre. Hence they strengthened their field fortifications at Caen and St. Lô, taking every possible advantage of the tangled difficult *bocage* country between those tns. The Brit. encountered strong resistance before Caen but captured most of the tn. by July 9; while the Amers. took the important tn. of St. Lô on July 18. The breakthrough began a week later and soon Amer. columns of the Third Army under Gen. Patton (*q.v.*) were sweeping W. into Brittany and S. to the Loire. The Gers. made a desperate effort at Mortain to cut the Amer. communications, but in the result sustained defeat with great losses. The Amer. forces now turned E. and captured Le Mans on Aug. 9.

*German debacle at the Falaise Gap.—**Allies enter Paris: Aug. 1944.*—The Amers. then swung N. towards Argentan whilst the Brit. and Canadians battled towards Falaise. In the Falaise 'pocket' so created, the Ger. Seventh and Fifth Panzer Armies were ruined, and the remnants (chiefly the Panzer divs.) fled headlong to the Seine. The pocket itself was eliminated on Aug. 22. This disaster, combined with a Fr. national revolt and victorious advance of The Amer. Seventh Army under Gen. Patch (*q.v.*), which landed in the S. of France on the strip of coast between Nice and Marseilles, convinced the Gers. at last that France could no longer be held. But an insurrection in Paris and four days fighting were necessary before the Gers. were thrown out of the capital. By Aug. 17 Amer. tanks had seized Chartres and Orléans and were rushing upon Versailles and Maut. On Aug. 24 a Fr. armoured force under Gen. Leclerc, of Lake Chad fame, entered the cap. (*see PARIS*), and the Ger. commander surrendered on the 25th.

*Gen. Alexander's troops enter Rome: Feb.-Aug. 1944.*—Before the great events of D-Day were actually in progress in Normandy, the last great Allied offensive had begun with Gen. Alexander's resumption of the offensive against Kesselring's positions between Rome and Naples. The former's armies, the Fifth and the Eighth, contained many different nationalities and among the most daring were the Fr. Moroccans who captured Monte Majo and pierced the strong Gustav Line in Feb. 1944. This magnificent feat of arms compelled Kesselring gradually to abandon his whole position S. of Monte Cassino and when Cassino (*q.v.*) itself was stormed a further advance linked up the troops with those on the Anzio-Nettuno beachhead. Rome (*q.v.*), which had not been seriously damaged by the Allied bombing of rail and marshalling

yards, was entered by the victorious Allies on June 4. The loss of Rome was due to Kesselring being completely out-maneuvred in an outflanking drive from the Anzio beachhead and the Alban Hills and in his retreat he lost many prisoners and much material. By late Aug., Alexander had hustled Kesselring back to the Gothic line, Florence (*q.v.*) being liberated, with, however, much damage, especially to its bridges.

*Russians resume offensive.—Conquest of White Russia.—Capture of Bialystok, Brest Litovsk, Vilna, Siauliai, and Kaunas: June to Aug. 1944.*—In the midst of their preoccupations on the W. and S., the Gers. found that the Russians had resumed the offensive. The first great blow fell in White Russia, around Vitebsk which fell on June 26, while the six Ger. divs. caught around the tn. were wiped out. In the ensuing month the Russians took Minsk, Vilna, Polotsk, Lyov, Bialystok, Brest Litovsk, Przemysl, Stanislov, and other strongholds. The Russians in the N., having seized Vilna on July 13, in their advance S. of the famous Pripyet marshes, and Grodno, Pinsk, and many other tns., in the N., were now seriously threatening the Ger. armies in the Baltic States with the result that the Gers. began 'pulling out' to some extent, thus they abandoned Pskov (23 July), and Narva. But the most dramatic reversal of Ger. fortunes was in Poland, where many tns. were captured by the Russians. Lublin, Siedlce, and Lvov (Lvów) fell, and the loss of the rail junction of Siauliai, cut off the last escape route into Germany from the more northerly Baltic States, and this loss was followed by that of Mitau (July 31) and Kaunas on Aug. 2. The Finnish puppet president resigned on Aug. 1, and the Gers. then took the opportunity of withdrawing their troops sent to support him.

*Attempted assassination of Hitler.*—An unsuccessful attempt was made on July 20 to kill Hitler by means of a small bomb in his operations-room, and this affair led to a 'purge' of high-ranking Ger. officers actually, or believed to be, implicated in the plot, and thousands of others who might have led another rising. As the result of this plot Himmler (*q.v.*) was appointed chief of all security forces, and also to the command of all the Ger. Home Forces. The gravamen of the charge against the 'purged' officers was that they were bent on making peace behind Hitler's back and certainly Germany was now beginning to be in desperate straits, relying upon untried 'secret weapons' (*see SECRET WEAPON*), to sustain the flagging morale of the Ger. people.

*Rise of the French 'Maquis', Aug.-Sept. 1944.*—The Ger. difficulty was now to withdraw divs. from the country which the Amers. and Brit., aided by the Fr. *Maquis* (F.F.I.) who rose everywhere, threatened to overrun. For some months the Allies could send troops only through battered Cherbourg and the artificial harbour of Arromanches. This restriction gave the Gers. an opportunity of reaching

the West Wall, but, W. of Paris, many were still resisting in the thickly-wooded bends of the Lower Seine, while E. of the cap. they were fighting on a line along the Marne though fully prepared to fall back on the famous forts of Metz, Nancy, Belfort, and Epinal.

**Germans driven out of France and Belgium.—Allies advance against the West Wall: Aug.—Sept. 1944.**—The Allies made their final assault on Germany in this order: Canadian First Army, Brit. Second Army, Amer. First Army, Amer. Third Army, Amer. Seventh Army, and Fr. Army. On Aug. 29, the First Army took Solssons and the Third Army took Verdun on Sept. 1, and St. Mihiel, being in fact already nearly 130 m. beyond Paris, which itself had fallen on Aug. 25. Patton was soon at the outskirts of Nancy and on the banks of the Moselle but, having outrun his supplies, had to wait and allow the Gers. to fortify the riv. line, and it was here that some of the toughest fighting of the W. front took place. Montgomery's advance was equally spectacular. Having estab. a bridgehead over the Seine on Aug. 29, his armour drove northwards for 250 m. liberating in a few days Amiens, Arras, Lille, Brussels (Sept. 3), and Antwerp (Sept. 4), and establishing a line which isolated all the Ger. forces in N.E. France including Meardy and the Pas de Calais, and also Flanders. This was now a war of manœuvre following many wearisome weeks of dour conflict in cramped beach and bocage country and the Allies took full advantage of their great opportunity. The Amers. took Namur, Liège, Ostend (both the latter on Sept. 8), and two days later having traversed Luxembourg, entered Germany and shelled Aachen. The Gers., having now been for the most part expelled from France, it now remained for the Allies to invade the line of the Rhine.

**The Battle of Arnhem, Sept. 1944.**—Before this line of defence was consolidated the Allies made a bold attempt to turn it and so shorten the war. This was the ill-fated Arnhem expedition, in which U.S. and Brit. airborne divs, and a Polish parachute brigade, were dropped in the hope of seizing the bridges over the Maas, Waal, and Lower Rhine. Ground forces successfully linked up with the two westerly airborne divs. but they were delayed at Nijmegen and arrived too late at the Lower Rhine. On Sept. 25-26 those troops of the Airborne Div. who could be withdrawn were brought back across the Lower Rhine. Just over 2000 were saved, but casualties numbered 7000. Fine weather was essential to employment of the low-flying Tactical Air Force, and very soon the heavy mists combined with the well-organised defence in depth compelled the Allies to face some months of methodical siege warfare against the chief Ger. positions. By Dec., Metz, Strasburg, Aachen, and most of the Channel Ports had been taken but these latter were too small to be of much use to the Allies and every effort had therefore to be made to make Antwerp available for use.

**Von Rundstedt's counterattack in the Ardennes, Dec. 1944—Jan. 1945.**—On Dec. 16, von Rundstedt launched a desperate but well-conceived Ardennes offensive, taking full advantage of the foggy, snowy weather. It was an elaborately-prepared attempt to reach central points of the Allied communications and so delay indefinitely the deployment of Gen. Eisenhower's full strength in a grand assault on the Reich. For a fortnight the Gers. made good progress in the direction of Liège, but extensive counter-measures were swiftly put into effect. The Gers. drove a wedge 45 m. deep, but the shoulders were held at Monschau, and, with great gallantry, at Bastogne. Fortunately for the Allies the weather cleared and from Dec. 22 the superior Allied air strength was thrown in with great effect. The tide of battle was now soon reversed and by the end of Jan., the Allied line was reformed. Their offensive had been delayed for at least six weeks, but Ger. losses were heavy, and the failure of their attack meant that the final issue could now hardly be in doubt.

**Capitulation of Rumania.—Premature Polish Rising in Warsaw: June—Aug. 1944.**—The Russian summer offensive, as shewn above, lasted from June to Aug. While success had favoured the Russians on every front, the resistance in the Baltic States, E. Prussia, and Poland was much stiffer and more effective than on the rest of the fronts. The Russians occupied all the chief Rumanian tns. between Aug. 21 and 31, and during that period Rumania capitulated to the Allies and accepted Russian peace terms. In this way the Gers. lost the irreplaceable Rumanian oil-supply and the best of their satellite Armies, while the gate was now open to the Russians to exploit the Balkans generally, and indeed a few days later Bulgaria declared war on Germany. Between Aug. and the end of 1944 the Russians continued to make most progress from the Balkan end of their front. Meanwhile, when Russian tanks and motorised infantry appeared 10 m. E. of Warsaw, the Polish 'Home Army' under Gen. Bor interpreted this as a signal for insurrection, and the order to start it was given on Aug. 1. When the Russians then retreated, the Polish insurgents were left to face the Gers. alone, with the most tragic consequences.

**Athens liberated.—Civil War in Greece: Oct. 1944—Feb. 1945.**—In the autumn, Ger. units began to filter back from Yugoslavia and Greece, attacked everywhere by insurgents, who were emboldened by the rumour of the oncoming Russian avalanche. Athens was liberated by the Brit. on Oct. 14, Belgrade by Tito and the Russians on Oct. 20. Following liberation, the Gk. Left partisans, E.L.A.S., or National Popular Liberation Army, E.A.M., or National Liberation Front, and other bodies, fomented a civil war, which was only stopped for a time by the energetic military and diplomatic intervention of Britain. Mr. Churchill himself visiting the country. While, however, the Gers. were driven out of the



Balkans and gradually from Yugoslavia too, the great Russian offensive in the S. had developed into the invasion of Hungary, where the siege of Budapest began in Dec. Hitler now began to reinforce his S. front with armour, which was badly needed elsewhere, for he must save Budapest and the approaches to Vienna at all costs. The Ger. counterattacks were so effective that the Russians could not conquer Budapest until Feb. 13, 1945.

*Germans launch flying bombs and rockets on England.*—Effective British war-time devices.—At the beginning of 1945, public opinion in the Allied countries was exorcised over the fact that the Gers. seemed to have neutralised their defeats in the W. and E. fronts so far, at least, as to be able to reorganise their defences and launch counterattacks. Moreover the Allies had no heavy tank to rival that of the Gers., who were, too, still designing and producing new 'secret weapons.' The Gers. started to launch flying bombs (V-1) on England from Fr. sites in June 1944. Following the capture of the launching sites in the Pas de Calais, the danger from flying bombs (V-1) was lessened although they continued to fall in Belgium (chiefly at Antwerp) until March, 1945. But the rockets (V-2) could not be warded off.

Brit. ingenuity overcame many difficulties: installations known as 'Pluto' (see under PIPE LINES), conveyed oil to the W. Armies through pipes laid under the sea. By the help of radar (q.v.), the bombers could hit targets which they could not see, and by the help of 'Fido,' a Brit. device for dispersing fog, they could take off and land in most kinds of weather. The opening of the Scheldt after the capture of Walcheren in Nov. 1944, made the great port of Antwerp available for handling supplies.

*Russian armies invade the Polish plains, E. Prussia, and Austria, Jan.-Feb. 1945.*—With the turn of the year, the Russians swept along a massive front to the plains of Poland, Prussia, and Austria. From the Baltic to Budapest their armies, which had already liberated Warsaw, Radom, Lodz, and Cracow, were tearing great gaps in the Ger. E. front in a grand final offensive on three main fronts: in the N. under Rokossovsky, in the centre under Zhukov, and in the S. under Konov; and, soon afterwards, Rokossovsky's right flank turned to co-operate with Cherniakovsky's forces from the E. in a combined assault on E. Prussia. The Ger. defeat was complete, and in Jan. the Russians captured Tilsit, Insterburg, Allenstein, and Tannenberg; on the 25th they took Gleiwitz in Upper Silesia and shortly afterwards crossed into Pomerania and Brandenburg. Breslau was encircled and besieged in Feb. Poznan fell on Feb. 23 after a month's siege and Torun had already fallen. It was evident to the Gers. that they could not hope to defend both the area of Berlin and that of the Upper Silesian coalfield. Hence they must organise a strong line along the Oder through Stettin and Frankfurt.

*Yalta Conference - Feb. 1945.*—From Feb. 5 to 12, Churchill, Roosevelt, and Stalin, met at Yalta to consider Russo-Polish relations and the allocation of administrative zones in Germany among the major Allies after the war. The conference also considered strategy.

*Allies' final Western Front offensive.*—Cologne taken.—Germans trapped in the Saar Basin.—Montgomery crosses the Rhine.—Americans encircle the Ruhr.—Canadians liberate Holland.—Bremen captured: Feb.-April 1945.—Stubborn fighting over the Dutch waterways and for the great Roer dams occupied the early weeks of 1945. Then on Feb. 22, a heavy bombing attack made on over thirty of Germany's chief rail depôts heralded the opening of the W. Allies final offensive with six armies (one Canadian, one Brit., three Amer., and one Fr.). The Roer was forced and its chief strongholds, Jülich and Düren, were captured on Feb. 24 and 25. The Allied armies in the N. closed on the Rhine crossings at Xanten, Wesel, and Rheinfert, and on March 7, captured Cologne. On the same day Amer. troops crossed the Rhine at Remagen (the one bridge which the Gers. had not succeeded in destroying), and the Gers. W. of the Rhine found themselves trapped by a link-up of the forces of Gen. Hodges' and Gen. Patton's armies. The attacks of the Canadian, Scottish, and other Brit. troops, and of the Amer. Ninth Army led to a general retreat on the N. sections of the Ruhr front. In a rapid advance Patton's army crossed the Moselle behind Coblenz, and, sweeping up the Rhine through Ludwigshafen, trapped between his and Patch's army nearly the whole of the Ger. armies in the Saar Basin and Palatinate. This freed the path for the invasion of Central and S. Germany and the situation was very rapidly exploited by the two Amer. generals whose victorious armies carried all before them. Mainz fell on March 20, and Frankfurt on March 26. On March 23 and 24, Gen. Montgomery made a double Rhine crossing with the Second Brit. and Ninth Amer. Armies. Other crossings further S. resulted in the Ger. abandonment of a 200-m. stretch of the Rhine. In the great crossing of March 24, 50,000 airborne troops were used and a great number of special landing craft, and the complete success of the operation finally deprived the Gers. of the Rhine as a bulwark of defence. The Amer. Ninth Army advanced, by-passing the Ruhr, and with Hodges' Army encircled the whole of that industrial area, trapping twenty-one divs. and taking 325,000 prisoners. The eventual capture of the Ruhr area proved far less difficult than was expected. The Brit. Second Army advanced through Osnabrück, with Bremen as its objective, while the Canadians were employed in the liberation of Holland. When the W. Allies reached the Elbe they were ordered to halt evidently in order not to encroach on a sphere already earmarked for the Russians. When the Allied thrust through Central Germany ceased, Amer. troops were practically on

the Czech border. Leipzig and Dresden were all but surrounded, and the Elbe had been crossed S. of Magdeburg. Hanover, Brunswick, Essen, Halle, Weimar, and Stuttgart had already fallen to the Amers. Breiten fell to the Brit. on April 26. When temporarily halted on the Oder line the Russians pressed forward on their right flank and, on their extreme left through Hungary. In the N. they took Königsberg on April 9. On April 13, they captured Vienna. Meanwhile the other Russian armies crossed the Oder and Neisse and the siege of Berlin had begun. Amer. and Russian troops met on the Elbe on April 25.

**Fall of Berlin.—Germany's unconditional surrender: April-May 1945.**—The final scenes were swiftly enacted. The Nazi leaders seem to have projected an 'Alpine Redoubt,' but the necessary stores and above all, workshops, were never installed in the area, which was already crowded with civilian services evacuated thence from N. Germany. It was then decided to make the final stand in the built-up area of Berlin, but it is probable that the Gers. did not hope to do more than hold out for sufficiently long to induce the Allies to grant more favourable terms than those of unconditional surrender or, still more probably, they hoped to divide the W. Allies and Russia. At all events, in the last week of April, Hitler (it was assumed that Hitler had perished in the ruins of his Chancellery), offered Germany's surrender to the W. Powers only, but the reply was that the Allies stood together. In Italy, Bologna was taken on April 21; Genoa was reached on April 27, and Milan on the 29th. It, partisans had previously estab. control in most of N. Italy. On the 28th Mussolini was captured by partisans when trying to escape into Switzerland and executed on the 29th. On May 1 the Hamburg radio announced Hitler's death and Admiral Dönitz (q.v.) proclaimed himself his successor as Führer. On May 2, Berlin surrendered to the Russians. On the next day Hamburg fell to the Brit. On May 5, the Ger. Nineteenth Army in the S., and on the 6th, Army Group G, surrendered. On May 5 all Ger. forces in N.W. Germany, Holland, and Denmark, surrendered to Field-Marshal Montgomery. On May 7, the final capitulation took place at Rheims, effective from midnight of 8-9 May. Formal ratification took place in Berlin on the night of May 9. With victory in sight, Roosevelt died on April 12, a grievous blow to the W. Allies.

**THE DEFEAT OF JAPAN: Americans land in Luzon: Dec. 1914-Feb. 1915.**—The sole success for Jap. arms in 1914 was in China, where, having at length captured Changsha and cleared the Chinese-held sections of the Peiping-Hankow railway, they took the offensive in S. China, and seized the airfields from which the Fourteenth (previously Tenth) Amer. Air Force had been raiding as far N. as Manchuria. They then made an ambitious attempt to reach the Burma Road (q.v.) which was about to be reopened, but were repulsed in Dec. by Chinese troops under

the Amer. genera Wedemeyer. Before the end of the year Leyte was practically conquered, after a campaign in which the Japs. lost over 82,500 soldiers, including many in transports sunk in hopeless attempts at reinforcement. Already Super-Fortresses were attacking Japan from Saipan Is., and Amer. progress in the Philippines indicated that such attacks would increase in vol. whatever might be met in China, whether through Jap. military success or Chinese civil conflict. On Jan. 9, 1945, MacArthur's forces landed in Luzon. Manila was occupied on Feb. 4. Bataan and Corregidor were cleared by the third week of Feb. The invasion of Luzon was accompanied and followed by heavy air attacks on Jap. bases and airfields in Indo-China and Formosa, which destroyed much of their air power and still further reduced their depleted shipping.

**Fall of Mandalay and Rangoon, March-May, 1945.**—In Burma the outlook was equally bleak for the Jap. The Fourteenth Army (q.v.) now closed on Mandalay, while the 15th Indian Corps seized Akyab and drove the Jap. from Arakan. Mandalay fell on March 20 after a well-executed operation had cut the Jap. S. communications at Meiktila. In March and April, the rest of the enemy's army in Central Burma was destroyed or driven, mainly, into the Shan Hills, and on May 2 Rangoon was entered and the remnants of the Jap. army, isolated, and faced with intermittent Burmese as well as Brit. attacks, had no hope.

**Okinawa conquered.—Atomic bomb dropped on Japan.—Japan's unconditional surrender: Feb.-Aug. 1945.**—The Jap. counsel of despair was to resist desperately in the belief that the losses they might inflict would induce the Allies not to insist on unconditional surrender and certainly those they inflicted, through 'suicide planes' carrying loads of explosives and through ground defence, were heavy. The garrison of Iwojima resisted to the last, from Feb. 19 to March 20. The reduction of Okinawa, defended to the death by 100,000 men, cost the Amers., whose Pacific Fleet had been reinforced by Adm. Rawlings's Brit. squadron, 40,000 casualties. Again, in Borneo, where Australian and Dutch forces landed at Tarakan (May 1), in Sarawak (June 19), and Balikpapan (July 1), the Jap. garrisons, cut off from any hope of succour, resisted desperately, as also they did in New Guinea and Bougainville. But defeat became more certain. City after city in the industrial regions of the Jap. homeland was bombed in attacks which almost rivalled in intensity those against Germany. On Aug. 6 the first atomic bomb exploded over Hiroshima (q.v.), destroying four sq. m. of the city. On Aug. 8, Russia declared war on Japan and next day the Red Army invaded Manchuria. On Aug. 9, a second atomic bomb laid Nagasaki (q.v.) in ruins. This proved enough, yet it is to be remembered that Japan was already on the verge of defeat; that day the Jap. Gov. accepted the Allied terms, provided these did not

prejudice the prerogatives of the Emperor, a proviso which did not in the interpretation make the surrender other than unconditional. The official surrender in S. E. Asia took place on Sept. 12 at Singapore.

**CONCLUSIONS.**—*The Ideals of the United Nations.*—Churchill's strategy.—If Roosevelt was the inspired interpreter of the ideals of the United Nations (q.v.) in this war of conflicting ideologies, in which W. civilisation was itself at stake, it fell to Winston Churchill to play the chief rôle of determining the grand strategy of the alliance. His was the imaginative vision that insisted, even when

his country to the pursuit of its traditional strategy, to maintain the Empire's lines of communications round the globe, to contain the enemy within the ring of sea-power, and to challenge him on land at the extreme limits of his dominion until his strength should begin to exhaust itself. Thus would time be won to mobilise the reserves of the imperial commonwealth and to range in the line for the decisive stroke, the forces of all other nations that would rally to the standard of liberty. (*The Times*, May 8, 1945.)

It may be freely acknowledged that there was a time when, had the Germans' mastery of the art of war matched the immense superiority of their material power, no human valour or effort could have defeated them. But in the Second, as in the First, World War, Germany failed to achieve an early victory, and the passage of time found her unable to equal the growing strength of the U.S.A., the Brit. Commonwealth, and Russia, even though the first two were burdened by the fight against Japan. The outstanding feature of the Second World War was its totality; the belligerents' resources were developed to the utmost degree, the idea of 'rules of war' was abandoned, and the distinction between civilian and soldier became irrelevant in the face of air-power.

For operations in detail see AFRICA, NORTH, SECOND WORLD WAR CAMPAIGNS IN; BURMA, SECOND WORLD WAR CAMPAIGNS IN; CRETE, THE BATTLE OF (1941); EASTERN FRONT OR RUSSO-GERMAN CAMPAIGNS, IN SECOND WORLD WAR; GREECE, SECOND WORLD WAR, CAMPAIGNS IN (1941); ITALIAN FRONT, SECOND WORLD WAR, CAMPAIGNS ON; ITALIAN EAST AFRICA, SECOND WORLD WAR CAMPAIGN IN (1941); MALAYA, BRITISH, JAPANESE INVASION OF (1941-42); NORWAY AND DENMARK, GERMAN INVASION OF (1940); NAVAL OPERATIONS IN SECOND WORLD WAR; PACIFIC CAMPAIGNS ON FAR EASTERN FRONT, IN SECOND WORLD WAR; WESTERN FRONT IN SECOND WORLD WAR. See also 'ADMIRAL GRAF SPER'; AERIAL WARFARE; AIR RAIDS; ANTI-AIRCRAFT COMMAND; 'ARK ROYAL'; BERLIN, PACT OF (1940); 'BISMARCK'; THE BRITAIN, BATTLE OF; CASSINO, BATTLE OF; CASUALTIES; COMBINED OPERATIONS COMMAND; DIEPPE RAID; EIGHTH ARMY; EUROPE, *History*; FLANDERS, BATTLE OF (1940); FORTIFICATION, *Field Fortifications and Tactics in the Second World War*; FOURTEENTH ARMY; HOME GUARD; LONG RANGE DESERT GROUP; MATAPAN, BATTLE OF; MEIN KAMPF; PEARL HARBOR; POPOVSKI'S PRIVATE ARMY; SAN FRANCISCO CONFERENCE; SANGRO; SECRET WEAPON; SPECIAL AIR SERVICE; STRATEGY AND TACTICS.

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THE SURRENDER IN SOUTH EAST ASIA

Admiral Mountbatten, Supreme Commander South-East Asia, announcing the signing of the Japanese surrender to the representative of the fighting services of the Allies and the people of Singapore, Sept. 12, 1945.

England lay isolated before the imminent threat of invasion, upon preparing a design of war that would offer full scope for the existing unity of the Brit. Empire and for the larger unity of world powers of which he foresaw it must become the nucleus before victory was won. A strategy concentrated upon the safety of the Brit. Isles would have lost the war. But it needed great courage to act upon that opinion when action meant diverting to the Middle E. the only armoured formation available to meet the expected descent upon the Channel coasts. With a deep knowledge of military hist., Churchill committed

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Worm, see SCREW-NAILS.

Worm Grass, see PINK-ROOT.

Worms, city of Germany, on the Rhine, in the former republic of Hesse, 10 m. from Mannheim. Its notable building is the Romanesque cathedral of SS. Peter and Paul, dating from the twelfth century, but there is also the church of Our Lady, a handsome Gothic building outside the tn., finished in 1467, the church of St. Paul (1102-1116) which is now converted into a museum, the Luther monument (1868) designed by Dietschel, the hospital, and the tn. hall. The Bischofshof, in which the Ger. diets met, is now replaced by a modern building. The tn. is one of the oldest in Germany, and in the time of Ariovistus was a Ger. chief's residence. It was fortified by Drusus in 14 B.C., and in the fifth century was the cap. of the Burgundians. It was a bishopric from Rom. times until 1797. As early as 1074 it was an imperial city, and was a free city in the thirteenth century. It is a riv. port with important industries and trade. The manufs. include leather, machinery, wool, cloth, chicory, and slates, while many of the inhab. are employed in the cultivation of the vine, the most famous wine being known as *Loebfraumich*. Though damaged during the Second World War, its most historic buildings survived. Pop. 51,340.

Worms, see ANTHELMINTICS, PARASITES. EARTHWORMS.

Wormwood (*Artemisia absinthium*), tall perennial plant (family Compositae) with silky stems and leaves and numerous small yellow flower heads. It is one of the chief ingredients from which absinthe is derived, and is used as a tonic.

Wormwood Scrubs, dist. of W. London in the bor. of Hammersmith, lying N. of Shepherd's Bush. It gives its name to a recreation ground. There is a large prison.

Worsborough, urb. dist. and industrial and agric. tn. of the W. Riding of Yorkshire, England, 3 m. S. of Ransley. It is a colliery centre. Pop. 14,000.

Worsley, urb. dist. of Lancashire Eng-

land, 6 m. from Manchester. There are coal mines, cotton factories, and engineering works. Here was begun the Bridgewater Canal in 1759. Pop. (estimated) 28,000.

**Worsted**, see under WOOL.

**Worthing**, municipal bor. and seaside resort on the Eng. Channel, Sussex, England. It is 10½ m. from Brighton and 60 m. from London. There is a fine marine parade and numerous parks and public gardens with tennis courts, putting greens, and bowling greens, a pier, three golf courses, and good bathing and boating facilities. At Broadwater, within the bor., is the church of St. Mary, a fine example of mingled Saxon and Norman ornamental architecture. The new tn. hall dates from 1932. Flowers and fruit are grown. An extension of boundaries in 1929 incorporated Goring, Durrington, and other outlying areas. One member is returned to Parliament. Pop. 70,000.

**Wotan**, see ODIN.

**Wotton, Sir Henry** (1568-1639), Eng. diplomat and poet, b. near Maldstone and educated at Winchester and Queen's College, Oxford. He was secretary to the Earl of Essex during Elizabeth's reign, and under James I. was for twenty years in the diplomatic service. W. was the originator of the epigram, 'an ambassador is an honest man sent to lie abroad for the good of his country.' In 1624 he was made provost of Eton. Izaak Walton's life of Wotton was prefixed to the *Reliquiæ Wottonianæ* (1651). See also life by L. P. Smith, 1907.

**Wound Balsam**, see FRIAR'S BALSAM.

**Wounds**, rupture of the soft structures of the body. They are usually classified as incised, punctured, contused, and lacerated. An incised W. is a clean cut, such as is made by a knife. The blood-vessels being cut clean, they bleed more freely than other kinds. The opening tends to gape on account of the retraction of the superficial structures. When the edges of such a W. are kept closed together healing generally proceeds by 'first intention,' that is, the two surfaces soon become united by a film of lymph, which develops into connective tissue. Punctured Ws., are those produced by the thrust of a pointed instrument. They are dangerous according to their depth; a deep-seated organ may be injured or the instrument may have carried in septic germs. There is frequently little bleeding apparent, though there may be dangerous internal hemorrhage. Contused Ws. are caused by blunt instruments, or by falls. There is usually very little bleeding, though the parts may be extensively bruised. Owing to the injury to the small blood-vessels, healing may be protracted. Lacerated Ws. are produced by injuries from machinery, the teeth and claws of animals, etc. They are dangerous when extensive, as there is considerable danger of infection by germs. Healing is usually by 'second intention'; a film of lymph forms over the W. and granulations form. A scar ultimately takes the place of the destroyed skin. If tissue has been much destroyed, extensive sloughing may take

place. In treating Ws. it is necessary first to arrest the bleeding and then close the W. Where there is danger of septic infection, however, the W. should be cleaned and dressed with antiseptics. Penicillin and sulphonamides, both local and systemic, are now much used in the treatment of infected Ws. Skin grafts are employed for closure. In wartime especially prophylaxis against tetanus is important; tetanus antidoxin is also available.

**Wouverman, or Wouwerman, Philips** (1619-68), Dutch painter, b. at Haarlem. Having studied under his father, Paul Wouverman, and Jan Wynants, he pursued his art in his native tn. with apparently little success, although his landscapes, hunting scenes and other pictures including horses, are now appreciated for their meticulous finish, composition, and colour. His brothers, Jan (1623-82) and Peter (1629-66) worked on like subjects.

**Wouw, Anton van** (1862-1945), S. African sculptor, b. at Drie Burgen, Holland, and studied at the Rotterdam Academy. He went to the Transvaal in 1890, and struggled for a living until he suddenly won a commission for the President Kruger statue in 1899. The work was interrupted by the S. African War and the monument erected only in 1925. Meanwhile van W. had become S. Africa's most outstanding sculptor in the naturalist tradition and produced fine studies in bronze, principally of the Bantu people.

**Wrangel, Carl Gustav** (1613-76), Swedish soldier, b. at Skokloster, Uppsala. He became a major-general of infantry at the age of twenty-four, and distinguished himself at the battles of Wolfenbüttel (1641) and Leipzig (1642). He commanded the Swedish fleet against the Danes in 1644-45 and in 1646 succeeded Forstenusson as commander-in-chief of the Swedish army in Germany, playing a prominent part in the later stages of the Thirty Years' War. He subsequently became a member of the Council of Regency, but failed as an administrator.

**Wrangel, Peter Nikolalevitch** (1878-1928), Russian soldier, b. in St. Petersburg. He served through the Russo-Jap. War and the First World War, mainly with the Cossacks. After the war he joined Kaledin (*q.v.*). Kaledin committed suicide in 1918, and W. joined Denikin's army. Denikin (*q.v.*), however, was defeated by the Bolsheviks in 1920, and he resigned, leaving W. in sole command of his disorganised army. Supported by the Fr., W. continued successfully to withstand the Bolsheviks until after they ended the war with Poland. W. was then compelled to evacuate his forces from the Crimea. He went to Belgium where he lived in exile.

**Wrangel Land**, New Columbus, or Long's Island, is in the Arctic Ocean off the N.E. coast of Siberia. It was discovered by Long, although von Wrangel made an expedition in search of it. It consists mainly of bare rocks which rise to a height of 2500 ft. in Mount Berry.

**Wrangler**, term applied in the Univ. of Cambridge, England, to those who have attained first-class honours in Part II. of the mathematical tripos, *i.e.* the final examination for honours in pure and applied mathematics. The one who took the first place in Class I. was, until 1912, called *Senior Wrangler*. Those in the second class are designated *Senior Optimes*, and those in the third *Junior Optimes*. The term is derived from an obsolete meaning of the verb, *wrangle*, meaning to give a public disputation.

**Wrasse**, family of fishes of the genus *Labrus*. The general form of the body is like that of the perch (*q.v.*), but the back is straighter. There is a single long dorsal, and the ventrals are under the pectorals. Coloration is generally very brilliant. The flesh is of little food value. *W.* frequent rocky shores, usually in small shoals, and often concealed in seaweed. Two species are Brit.—the Ballan *W.* and the Red *W.* Also known as rock fish.

**Wrath, Cape**, see CAPE WRATH.

**Wray**, John, see RAY (or WHAY), JOHN.

**Wrecks**. The law on *W.* is contained in the Merchant Shipping Act of 1894 so far as territorial waters are concerned. In earlier times flotsam, floating wreck; jetsam, property thrown overboard to avoid wreck; ligam, property sunk and marked with buoys for purposes of recovery; derelict, or totally abandoned property, were distinguished from wreckage cast on the shore, and were claimed by the Admiralty on behalf of the crown. These are all now included in the one general term. Local receivers are appointed by the ministry of transport, which has taken over the powers of the board of trade (which dept. had itself taken over those of the admiralty), and it is the business of the receiver to take charge of any wreckage found or brought in (except in the case of that brought from extra-ter. waters by a foreign ship). It is the duty of all persons finding wreckage to notify the receiver, who must proceed to the place and take complete charge, not merely of property but of all means of recovery, including the work of persons near, vehicles, means of approach, and so on, as also of public order; he also must notify the nearest customs-house, and, if the value is over £20, Lloyd's. The practical work is, in fact, done by Customs personnel though the controlling authority is the ministry of transport. The duties of the receiver, if he be absent, devolve on the chief customs officer, first; then on the chief officer of the coastguard, inland revenue officer, sheriff, justice of the peace, or officer of the navy or army on full pay. The wreckage, being received, is finally sold, unless claimed within a year by the owner, the proceeds being paid over to the crown or other person having the right, after the salvage (*q.v.*) claims and expenses have been deducted. These also must be paid before recovery by the owner, if his claim has been established. The authority of the ministry of transport is required for the sale of *W.* exceeding £5 in value. In any case, also, duty is levied on goods so recovered as if

they had been imported in the ordinary way. The receiver's duties also extend to cases of ships in distress and any services rendered; he, or a wreck commissioner appointed by the lord chancellor, holds a court of inquiry. When *W.* occur in navigable water-ways or harbours, the authorities responsible for the safety of such places have power to remove them, and claim expenses from the owners or underwriters if they have entered into possession. The statutory power given to harbour or conservancy authorities to remove or destroy any vessel sunk, stranded, or abandoned in any harbour or tidal water under their control and to sell the wreckage so as to reimburse themselves for the expense does not extend to His Majesty's vessels (*Christie v. Trinity House*, 1919). The term wreck applies only to tidal waters and to vessels and their contents; in the U.S.A. it applies also to inland lakes and the large rivers. In proportion as ships have become larger and have discarded sails, the number of *Ws.* has largely diminished; storm warnings have contributed to the safety of vessels. On the other hand, the value of *W.* is generally larger and salvage may be very remunerative. The law relating to *W.* and salvage and to the duty of rendering assistance to vessels applies to aircraft on or over the sea or tidal waters in the same way as it applies to vessels, and, for this purpose, the law includes the Merchant Shipping Acts and other Acts covering the same subjects. In the past forty years, so far as Brit. *W.* are concerned, there were more losses of life at sea in the years 1912 and 1914: in 1912 a total of 2335, including 673 of the crew and 825 passengers on the *Titanic* (*q.v.*); and in 1914 a total of 1778, including 171 of the crew and 840 passengers on the *Empress of Ireland*. In 1928 the total was under 300; and in 1929 131 lives were lost. From 1932 and 1945, 952 vessels were lost and 1193 lives, the highest losses being 142 vessels in 1935 and 215 lives in 1936. (Losses by hostile action in the two World Wars are not included.)

See Board of Trade, *Instructions as to Wreck and Salvage*, for salvage operations. See also SALVAGE.

**Wrekin, The**, see under SHROPSHIRE.

**Wren**, Sir Christopher (1632–1723), Eng. architect, b. at E. Knoyle, Wilts. He went to Westminster School and at the age of fourteen was sent to Wadham College, Oxford, and at twenty-one was elected Fellow of All Souls'. As a young man he was interested in astronomy, and in 1657 he was appointed prof. of astronomy at Gresham College, London, but a few years later Savilian Prof. of Astronomy, Oxford. He was about thirty when he devoted himself seriously to the profession by which he became famous. After serving as assistant to Sir John Denham, the surveyor-general, he was appointed his successor in 1661, in which year he was made a doctor of civil law. The number of his buildings is very great, and includes the chapels of Pembroke and Emmanuel Colleges, Cambridge; the Sheldonian Theatre, Oxford; St Paul's

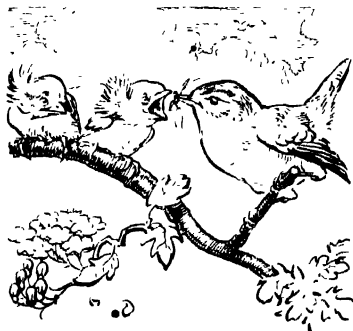
Cathedral, London; and also the London churches of St. Sepulchre's, Newgate; St. Michael's, Cornhill; St. Stephen's, Walbrook; St. Bride's, Fleet Street; St. Clement's, Eastcheap; and other city churches (sev. were destroyed or heavily damaged by bombing during the Second World War); the Royal Exchange, London (destroyed by fire in 1838); the Monument, London; Temple Bar; buildings at Christ's Hospital, Newgate Street—now destroyed; lower parts of the towers of the W. front of Westminster Abbey; Royal Observatory, Greenwich; Chelsea Hospital; Marlborough House; Windsor in hall and additions to Hampton Court. After the Great Fire of 1666, he was made surveyor-general and prin. architect for rebuilding the whole city. He proposed a plan for laying out London, but it was not adopted. It reveals the full genius of W. Had it been carried out, the city of London would have surpassed in spaciousness and dignity any other cap. After 1668 his services were extensively employed that he had to resign his professorship in 1673. In 1674 he was knighted; in 1680 he was chosen President of the Royal Society, of which he was one of the original members. He was a many-sided man, and his energy was prodigious. He is the greatest Brit. architect of modern times. His masterpiece, the present edifice of St. Paul's, was built, not from his first and favourite design, a model of which is in the Cathedral, but from a second one. That the result was so successful was due to the fact that a clause in the royal commission allowed W. to make any alterations in the plans that he chose. It was begun in 1675, and divine service was first celebrated in the choir in 1697; the last part of the lantern was laid by his son (see also ST. PAUL'S CATHEDRAL). W. was buried in St. Paul's Cathedral.

See *Parentalia* or *Memoirs of the Wrens*, by his son, 1750. See lives by L. Phillimore, 1881; L. Weaver, 1923; C. Whitaker-Wilson, 1932; G. Webb, 1937.

**Wren** (*Troglodytes parrulus*), common bird ranging throughout Europe, Northern

Africa, and Asia. It is about 4 in. long and has short rounded wings, and usually carries its tail over the back. Its plumage is rich reddish brown. It builds a large domed nest, and additional nests are often built close at hand. Its song is remarkably loud. It feeds almost entirely on insects. The gold crested W. (*Regulus cristatus*) belongs to the warbler family (*Sylviidae*).

**Wrestling**, one of the athletic exercises of almost every nation and common to every period, was practised among the Gks. from the earliest times, and in Homer's *Iliad* (xxiii. 700ff.) there is a fine and technical description of an early contest. The Gk. wrestling contest was divided into two parts: (1) the struggle to throw the opponent; and (2) the struggle on the ground, though on some occasions the simple throw decided the contest. At first the wrestlers wore a girdle, but in later times they wrestled naked. The body was previously rubbed with oil (strictly forbidden in modern W.) to make the muscles supple and to check perspiration, and was then sprinkled with sand to allow of a firm grip being taken. The loser had to be thrown three times before he was vanquished. Rom. W. was an imitation of the later form of the Gk. sport. Neither must be confused with the modern Greco-Rom. style which is almost identical with the most popular modern, Catch as Catch Can (Catch-Can) or Free Style, except that no hold below the hips is permitted and the legs may not be used for either offence or defence. Throughout the Middle Ages W. (Catch as Catch Can style) was a favourite sport in Eng., mainly among the common people, though some kings were accomplished wrestlers. The Londoners were particularly distinguished for their skill, though the Cornish and Breton wrestlers were acknowledged as the best in Europe. Various styles were used. Those which have survived until the present day, little altered in detail, are the Cornwall and Devon, and the Cumberland and Westmorland styles. In the former the contestants wear a short, loose, strong jacket by which all holds are taken. The heavy shoes, for kicking purposes, vanished more than a century ago. Falls are heavy; a throw is a 'fair back', i.e. both shoulders and a hip (or two hips and a shoulder) on the ground at the same moment. There is no ground W., which is a characteristic of both the Catch as Catch Can and Greco-Rom. styles. In the Cumberland and Westmorland style the struggle begins when each wrestler has taken the statutory hold and joined hands. For this the left arm of each wrestler passes above the other's right arm, his right arm under the other's left, and hands are then locked across the back. To break this hold is equivalent to defeat. This is the simplest and fairest style of W.; it is on the first down to lose principle. Any part (other than the feet) touching the ground means a fall. If both men fall the one first touching the ground is the loser. The style still flourishes in the N. Eng. cos., and, to a lesser extent in parts of Scotland



The Japanese style of W., *Judo* (formerly *Ju Jitsu*) is more than a sport; it is a method of self-defence and originally a war exercise. It differs entirely from the national (professional) style called *Sumo*. Based on an accurate knowledge of anatomy, it includes much of ordinary W. with additions which admit of strangulation, dislocation of joints, and blows struck with the edge of the open hand. It has become very popular, as an exercise, throughout America and Europe. Catch as Catch Can includes all that the name implies, but a large number of punishing grips and moves are forbidden in order to exclude the use of brutal or dangerous tricks. It is correct to state that this style is practically universal; twenty-seven nations were represented in the Olympic Games wrestling of 1948. Professional W. in the All-In style still exists on the continent, in America, and Australasia, but as an athletic exercise is negligible. See P. Longhurst, *Wrestling*, 1917; G. Haekonschmidt, *Complete Science of Wrestling*, 1929; E. Gruhn, *Text Book of Wrestling*, 1930, 1947; and H. A. Oberholzer, *Recreative Wrestling*, 1949.

**Wrexham**, mun. bor. and mkt. tn. of Denbighshire, Wales. Its church of St. Giles, rebuilt about 1470, is one of the 'seven wonders of Wales.' Industries include coal mining, brewing, tanning, and textiles. It is an agric. centre. Elihu Yale (*q.v.*) who was a patron of Yale Univ., is buried here. Pop. (estimated) 30,000.

**Wright, Orville** (1871-1948), Amer. aviator; b. at Dayton, Ohio, and educated at the local high school. He became a journalist. Then with his brother, Wilbur (1867-1912), he started a bicycle business. The brothers became interested in flying, and made a heavier-than-air machine (on whose basic plan all aeroplanes are constructed) on the biplane principle with an elevator out in front of the glider, but no tail or vertical rudder. O. W. flew in it at Kitty Hawk, N.C., Dec. 17, 1903, the first time any person rose from ground in actual flight by mechanical means. Later the brothers conducted a successful air-craft business. In 1917 O. W. received the medal of the Royal Society of Arts. In 1942 he was elected as hon. member of the Institution of Mechanical Engineers. In Oct. 1948, the 'Kitty Hawk,' in which the brothers made the famous flight, was returned to the U.S.A. by the Kensington Science Museum, where it had been displayed since 1928, for preservation in the National Air Museum in Washington.

**Wrist, or Carpus**, that portion of the arm between the hand and the lower arm. The joint is made by the articulation of the ulna and radius with the carpal bones. The mobility of the joint is combined with a great degree of strength, so that dislocations and sprains are not common. Fracture of the lower end of the radius is known as Colles' fracture.

**Writ**: 1. In the literal sense of that which is written. W. is particularly applied to the Scriptures, or books of the O.T. and N.T., and again, in Scots law, the

term is sometimes used to denote a writing, deed, or any legal instrument. 2. In Eng. law, a W. is a precept under seal in the name of some executive officer, such as the lord chancellor or a judge, having jurisdiction or authority in the particular matter, and directed to some public officer such as a county sheriff or to some private person, commanding him to do something in relation to a suit or action. In this sense a W. is a legal document which in effect is the first step in legal proceedings, civil or criminal (*see* SUMMONS). Some of the more important of the multifarious Ws. in Eng. law are the W. to the county sheriff to elect a member of Parliament, a W. of habeas corpus (*q.v.*), Ws. of mandamus (*q.v.*), prohibition (*q.v.*), and quo warranto (*q.v.*), Ws. of subpoena ad testificandum, and subpoena duces tecum.

**Writer's Cramp**, *see* CRAMP.

**Writing, Epistolary**, *see* LETTERS.

**Writers to the Signet**, *see* SIGNET.

**Writing** is the most important method of record-keeping and of communicating ideas or sounds of the human voice, by marks or significant and convenient symbols, painted or drawn, traced or incised, on paper, stone, metal, or any other material. W. is an integral part of our civilisation; it is, indeed, the main currency of civilisation. It is one of the main aspects of culture which clearly distinguish mankind from the animal world. W. is the graphic counterpart of speech: each element (written symbol or letter, or written word) in the system of W. corresponds to a specific element (sound or group of sounds, such as spoken words or syllables) in the primary system. Although writing is not considered as a separate branch of learning, it forms the main basis for two important fields of study, epigraphy (*q.v.*) and palaeography (*q.v.*), and some of its sections form part of other depts. of learning, e.g. hieroglyphics (*q.v.*) is part of Egyptology, and cuneiform W. (*q.v.*) is part of Assyriology.

**Origin of Writing.**—We do not know the inventor of W., nor when and where arose the knowledge of the art—and we may never know. It is probable that there were periods, ages long probably, during which perishable W. materials (*e.g.* bark or wood) were employed; we can dig up thousands of inscriptions (*q.v.*), but it will never be possible to recover earlier documents made of non-durable matter. Yet hist. naturally relates what we know (although there is no doubt that only an insignificant part of the story of mankind is known), and thus the hist. of W. must be based mainly on preserved documents. Much of the earliest records of men has been found in the drawings and paintings left by the cave-dwellers in S. France and in Spain. At some remote time, in the Upper Palaeolithic Age (belonging perhaps to 20,000 B.C.), Primitive Man drew pictures of the beasts on whose flesh he fed, on the walls of his cave, and painted them with coloured earths and vegetable dyes. He also carved sketches on the bones of the animals he had killed.



or upon rude stone implements. It is still uncertain, however, whether these realistic pictures represent the beginnings of art or of W., or of both. If these pictures or sketches were done not only for amusement in the long leisure hrs., but also for the perpetuation or transmission of thought, then they may represent the beginnings of W. It is, however, more probable that these paintings or sketches were done for purposes of 'sympathetic magic' or for ritual practices, and not because of the urge to record important events or to communicate ideas. The same may be said of the numerous riv. pebbles of the Azilian culture (Middle-Stone Age), painted with peroxide or iron, with dots and lines, etc.; of the various 'petroglyphs,' that is geometric signs or conventionalised figures of men, painted or engraved on rocks, or stones of megalithic tombs and other monuments of Neolithic Age (q.v.), found in various Mediterranean, and many other, countries all over the world. If these prehistoric pictures and sketches do not represent the beginnings of W., then it is preferable not to attempt a chronological hist. of W., but to classify it according to its nature and to certain recognised terms, on the assumption that these terms indicate types of W. and stages of development, which are not necessarily chronological.

*Embryo Writing.*—Prehistoric Man did not think about true W.; even nowadays there are primitive peoples who can do without it. Indeed, members of primitive tribes seldom venture beyond the natural boundaries of their tribal ter., and various acoustic and optic devices suffice for communication. Small communities of agric. peoples, living in vils., have developed systems of communication based on the principles of sound, or acoustics (war-cries of the Negritos of Luzon; whooping of Creek Indians in N. America, etc.). Pastoral peoples who live scattered over wide areas have developed optic devices of communication (smoke-and-fire signals of prairie tribes of S. America, or similar devices). The simplest form of optical communication is, of course, the gesture, which may be used not only to indicate single key-words representing numbers, objects, moods, or directions, but it may be perfected into an actual substitute for language, e.g. the gesture language of deaf-mutes (see under DEAF AND DUMB), or signalling methods used at sea or in the mts. As man rose from his primitive state towards civilisation, he must have felt a need for recording his knowledge in some permanent form, or of helping his memory in conveying an important message. Rude systems of conveying ideas are found everywhere, in anct. tradition, or survival, or are in use to-day. Herodotus (II. 16) describes a 'letter' sent by the Scythians to the Persian king Darius; it consisted of a bird, a mouse, a frog, and five arrows; its meaning was as follows: 'Persians, can you fly like a bird, hide yourselves in the ground like a mouse, leap through swamps like a frog? If you cannot, then

do not try to go to war with us; we shall overwhelm you with arrows.' Similar codes of tokens for sending messages are still found among various primitive peoples, such as the Niam-Niam (Upper Nile, Africa), the Batak of Sumatra, the Lu-tze on the Tibeto-Chinese frontier (a piece of chicken liver, three pieces of chicken fat, and a chili, wrapped in red paper, indicated 'prepare to fight at once'), and other tribes. The most interesting, however, are the symbolical epistles *aroko* (= 'to convey news') of the Yebu and other tribes in Nigeria. *Culumet*, the sacred decorated reed tobacco-pipe of N. American Indian tribes, was used as symbol of peace or war. Some Amerindian tribes used to send to the president of the U.S.A. a feather-trimmed ear of corn whose hollowed-out inner part was filled with tobacco, and around its centre a woollen cord was slung, also trimmed with yellow feathers: the message was a declaration of peace ('The pipe shall be smoked by the president'). The *ndangas* and *bolongas* of the Bangala people (Upper Congo R.) should also be mentioned.

*Memory-aids.*—The most known mnemotechnic devices are the notched message sticks and the knotted cord. The former are still employed by primitive tribes in Africa, China and the Far E., Australia, and elsewhere. Some Serbian peasants still use notched sticks in place of account books and bills. Formerly it was also employed in England (see under TALLY), anct. Scandinavia, Russia, Italy, N. America, etc. In Australia, notched sticks were employed for conveying messages of different kinds (tribal assemblies, calling for war, invitations to feasts, initiation ceremonies, or even regular commercial orders), but the sticks were mere memory aids to the carriers of these messages. The knot-device is another wide-spread memory-aid. Anct. China seems to have employed the 'knot-writing'; so did the anct. Tibetans, Ainus, Sonthals, Persians, and Mexicans. Even to-day we may find primitive tribes in Africa, or in Polynesia, who know the 'language of knots.' The knot-device was the basis of the anct. Peruvian *quipu* (q.v.). Extremely interesting are the small wooden counting boxes of the Cara tribes of Ecuador: these contain pebbles of different shape, colour, and size, to record numbers or events. Other common memory-aids are property marks; used by the anct. Canaanites, Egyptians, Minoans: the Frisian *Boemmerken*; the modern Lapps, Votjaks, Cherkessians, Masai of E. Africa. Australian tribes, Canadian and Amerindian tribes, and others still employ them. Mention may be made of the *wusums* (or cattlemarks and brands), with which Arab tribes E. of Damascus mark their camels, sheep, and horses, as well as of the *tamgas* or symbolical marks or seals of anct. Turki tribes.

*Pictography.*—While the aforementioned primitive devices of communication (in which the employed symbols are mere memory-aids and need the interpretation

of the messenger) may be considered as preliminary stages of W., pictography or picture-writing is the first stage of true W.: in this, the painted or drawn or traced pictures, known as pictograms, speak for themselves. Pictography (q.v.) may be subdivided into three classes:

(i) *Iconography*, which gives a static impression; the pictures are motionless, and they represent the things shown (the sketch of an animal would represent this animal, a circle might represent the sun, etc.); to-day, with action photographs and motion pictures, comic strips and illustrations, the introduction of action into pictures seems a small thing; actually it was a very important development when the 'writer' began to 'write' picture-stories, i.e. when he began to make pictures tell stories.

(ii) *Ideography* (see under IDEOGRAPHY). There arose, thus, the synthetic or ideographic writing; this can be best studied in the Ws. of primitive tribes of to-day (in Polynesia and Australia, in W. Africa, in N. and Central America, among the Yukaghirs of N.-E. Siberia, etc.), but the most famed among the pictorial documents are those of the N. Amer. Indians, so beautifully described by Longfellow in *The Song of Hiawatha* (xiv).

(iii) *Analytic Writing*. Neither iconographic W. nor synthetic W. constitute complete systems of W., as is in fact the case of analytic Ws. in which definite pictures, conventional and simplified, selected by agreement or custom from many experimental pictures, became fixed pictorial symbols, constantly used. Only eight or nine systems of W. belong to this category, the cuneiform W. (q.v.), the hieroglyphic-hieratic-demotic Ws. (q.v.), the scripts of the Indus Valley people, of the Cretans, Hittites, Chinese, Mayas, and Aztecs, and probably also the mysterious Easter Island W. These systems, however, are already partly phonetic, and are, thus, transitional between the pure pictographic and the phonetic W.

*Phonetic Writing*. It was a long way from the primitive pictography to the phonetic W. In pictography there is no connection between the depicted symbol and the spoken name for it. In phonetic W., which is the graphic counterpart of recording speech, each element corresponds to a specific element (i.e. sound) in the language to be represented. The first steps taken in phonetism may be found in the 'rebus,' in which the pictures of objects do not stand for the objects themselves, but for the sounds they recall, i.e. the pictures shown have names sounding like or similar to the word intended: Englishmen, for instance, could in this way represent the name Woodbury by a row of trees (forest, wood) and a picture of a berry. This evolution from concrete representation to abstract symbol—the thing-picture and idea-picture turning into sound-picture—was part and parcel of the main analytic scripts (hieroglyphics, cuneiform W., Chinese W., etc., see above), which, however, are not pure phonetic Ws., because they continue to

employ ideographs and word-characters. Pure phonetic W. may be syllabic or alphabetic.

*Syllabary* or *Syllabic Writing* is the less advanced stage of pure phonetic W. Syllabaries existed in anct. times, in Hyblos (N. Syria), Assyria, Cyprus; two syllabaries derived from Chinese W. have become Jap. scripts; artificial modern syllabaries were, or still are, employed in Africa, N. America, and in China. In syllabic Ws. the single symbols represent syllables generally, or vowels, when these constitute syllables.

*Alphabetic Writing* is the last and most highly developed system of W.; its development constitutes a story in itself (see under ALPHABET).

The development of cursive W. is dealt with in the article PALEOGRAPHY. The origin and the development of the numerals, and the hist. of abbreviations and of stenography, are other problems connected with W. (see under ABBREVIATIONS, NUMERALS, and SHORTHAND).

See J. G. Février, *Histoire de l'écriture*, 1918; O. Ogg, *The 26 Letters*, 1949; J. E. Lips, *The Origin of Things*, 1949; and D. Diringer, *The Alphabet: a Key to the History of Mankind* (2nd. ed.), 1949.

Wrocław (Ger. Breslau), city of the prov. of Lower Silesia, formerly in Prussia, and since the end of the Second World War occupied, with the remainder of the prov., by the republic of Poland. It is situated at the junction of the R. Oder with the R. Ohlau, about 150 m. S.E. from Frankfurt-on-the-Oder, and 190 m. from Berlin. The Oder divides the city into an old and a new tn., and these with their many suburbs are connected by a number of bridges. The cathedral was begun in the twelfth century and finished in the fifteenth, and was later enlarged and restored. There were before 1945 sev. fine Protestant and Rom. Catholic churches of historical interest. Until 1812 the tn. was well fortified, but the fortifications were then made into promenades, while the moat was turned into an ornamental piece of water. W. became the centre of all the manufacturing dists. of the prov., its manufs. being silk and woollen goods, linen and cotton fabrics, lace and jewellery, earthenware, soap, starch, alum, machinery, etc. There was considerable trade in coal, corn, flax, hemp, timber, and metals, W. being the point at which the manufactured goods of the W. were exchanged for the natural products of the E. Over 60,000 workers were employed in the clothing, building, and machine-making trades, and two large fairs were held annually. Before the Second World War the Ger. univ. *fr.* with a student-roll of 3500, and over 1000 students attended the technical high school. The city suffered severe devastation during the war, particularly during its 9 weeks' siege by the Soviet armies in 1945. It was occupied by the Russians on May 12, 1945. (See EASTERN FRONT, OR RUSSO-GERMAN CAMPAIGNS, IN SECOND WORLD WAR.) The pre-war pop. was 615,000.

Wrong, George Mackinnon (1860-1948

Canadian historian, b. in Elgin co., Ontario and studied at Toronto Univ. After a course at Wycliffe Hall he was ordained in the Church of England in 1883. He accepted a lectureship in hist. at Toronto Univ. where he proved a successful and popular teacher; he was professor of hist. at the same univ. from 1891 until his retirement in 1926. W. was especially noted for his writing on the hist. of Fr. Canada and some of his works have long been used as hist. text-books in Canadian schools and univ. Chief works: *The British Nation, a History* (1903); *The Rise and Fall of New France* (1928); *Canada and the American Revolution* (1935); and *The Canadians, the Story of a People* (1938).

**Wrought Iron**, see IRON AND STEEL, *Steel and Wrought Iron*

**Wroxeter**, vil. of Shropshire, Eng., on the Severn, where it is crossed by Watling Street, 6 m. S.E. Shrewsbury, was the tribal cap. of the Cornovii, and later as Viroconium an important tn. in the urb. life of Rom. Britain. It was the fourth-largest tn. in Rom. Britain with an area of some 170 acs. Epigraphical and literary evidence points to its foundation about A.D. 48, as a legionary camp (or possibly fortress) in the campaigns of Ostorius Scapula against the Welsh, and it so continued until under Agricola the Fourteenth and Twentieth Legions were transferred to Chester. It was, apparently, after this that it became the tribal cap. of the Cornovii who had been forced to leave their own hill-city on the Wrekin. The imposing forum was built by A.D. 130, and followed by a basilica and other public buildings on a grand scale. Much was destroyed by fire about A.D. 300. There was subsequent rebuilding of public and private buildings on a smaller scale, and a considerable occupation well into the fourth century. Excavations were made between 1912 and 1937. The chief remains now to be seen are parts of the forum and basilica, and of the great public baths. The site is protected as an anct. monument, and a museum is maintained. See *Research Reports Society of Antiquaries*, *Wroxeter* 1, 2, 3 (1913-16), and *Archæologia*, Vol. 88 (1938), 175.

**Wryneck**, genus (*Iynx*) of small birds of the *Picidae* or woodpecker family, of which only four species are known, three of which are peculiar to Africa. These are *I. pectoralis* (S. Africa and the Congo), *I. pulchricollis* (Upper White Nile), and *I. aquatorialis* (Abyssinia). The fourth species, *I. torquilla*, is the common wryneck, of Europe. Its general colour is brown and grey with black markings; its length 6½ in. It sometimes runs up trees exactly like a true woodpecker. Its name is derived from its habit of twisting its neck as it picks up ants or other insects.

**Ulphilas, Ulfilas, Ulphilas** ('little wolf') (c. 311-385), translator of the Bible into Gothic. Consecrated bishop in 348, he was expelled by his heathen compatriots from his native place, and sought refuge in Lower Moesia, where he remained for thirty years. In 385 he went to Constantinople (where he had gone once before

in 360 to assist at a council), and d. there shortly afterwards. He was one of the chief supporters of Arianism. His greatest work, however, is his Gothic trans. of the Bible, a work by which he contrived both to fix the Gothic language and to perpetuate Christianity among the Gothic people. See study by C. A. Scott, 1885. See also H. M. Gwatkin, *Studies of Arianism*, 1882; G. H. Balg, *Ulphilas*, 1891.

**Wuchow**, former treaty port of China, on the Sikiang, in the prov. of Kwangsi. It is the distributing centre between Canton, Kwangsi, and Kweichow, and exports sugar, and various oils. Pop. 51,800.

**Wuhu**, former treaty port of China, in the prov. of Nsanhui, on an affluent of the Yangtze-kiang. It exports rice, cotton, tea, etc. It is also a manufacturing tn., and is noted for its cutlery, and steel articles. Pop. 136,000.

**Wulfrunhamton**, see WOLVERHAMPTON.

**Wulstan, Wulstan, or Wolstan, Saint** (c. 1012-95), Eng. saint and prelate, b. at Long Itchington, Warwickshire. He studied at Evesham and Peterborough abbeys. He became a Benedictine at Worcester and bishop of Worcester in 1062. William I. allowed him to retain his see, though an Englishman. W. rebuilt Worcester Cathedral. He was canonized in 1203 and his feast day is on Jan. 19. (See also under WORCESTER.)

**Wuotan**, see ODIN.

**Wuppertal**, tn. of the Rhineland, Germany, see BARMEN and ELBERFELD.

**Württemberg**, former republic in the S.W. of Germany, a kingdom until 1918. It was bounded by Bavaria, Baden, and the Lake of Constance. It had an area of 7,530 sq. m. For the most part W. is mountainous, the chief mt. ranges being the Swabian Alps on the E. and the Schwarzwald which extends from S. to N. along the western border, gradually sloping towards the centre of the country. The chief rvs. are the Neckar and the Danube, into which almost all other rvs. discharge themselves. W. is one of the most fruitful regions of Germany, hay, potatoes, oats, barley, and wheat being the chief crops. Wine and beer are made. There are large forests. Iron and salt are worked, and there are sev. spas, such as Wildbad, famous for their waters. The prin. ma. iufs. are linen and woollen cloths, silks, hosiery, furniture, motor cars, clocks, carpets, leather, porcelain, earthenware, iron and steel goods. Stuttgart was the cap., the leading univ. being at Tübingen. W. had a pop. of 2,696,300 in 1940. The pop. was predominantly Protestant, a minority of about 30 per cent belonging to the Rom. Catholic church.

The pop. of W. was originally Swabian. W. was colonized by the Romans. It was part of Frankish co. and of the Swabian duchy, but emerged as a separate entity under a family surnamed W. first mentioned in the twelfth century. This line was raised to ducal status in the fifteenth century. Duke Ulrich (1503-50) introduced Protestantism. Napoleon made W. a kingdom in 1805. W. always preserved an independent attitude towards Prussia,

supporting Austria in 1866 and only joining Prussia in 1870. In 1918 William II. of W. abdicated and a republic was proclaimed. Under the National Socialist regime W. was governed by a *Reich Statthalter*. After the Second World War W. was divided between the Fr. and Amer. zones of occupation. In 1947 the *Land* of Württemberg-Hohenzollern was created in the Fr. zone, with an area of 4017 sq. m. Tübingen was made the cap. In the Amer. zone the *Land* of Württemberg-Baden was created in 1946. It has an area of 5960 sq. m. Stuttgart was made the cap. These *Länder* comprise roughly the area of the old W.

Würzburg, city of Bavaria, situated in a valley on the Main, is one of the oldest tns. in Germany, and has been the seat of a bishop since 741, and round it an episcopal principality gradually took shape. Its fine churches include the imposing twelfth-century Romanesque cathedral, the beautiful Gothic Marienkapelle, the Neumünster church, and the churches of St. Burchard and St. Stephen, a famous episcopal palace, and a univ. founded 1582. There are also many fine civic buildings in the baroque style. The dist. produces wine and fruit, and there are engineering, printing, iron founding, and furniture industries, etc. W. was heavily damaged during the Second World War, and many of its ant. buildings suffered severely. Pop. 90,000.

Wyandots, formerly large tribe of N. Amer. Indians, known also as Hurons. They were discovered on the E. shore of Lake Huron by the first Fr. explorers, with whom, notably with Champlain, they speedily formed an alliance. They were the traditional foes of the Sioux (*q.v.*), and in their dealings with whites were always ready to side against the Eng. settlers in America.

Wyatt, James (1746-1813), Eng. architect, *b.* in Staffordshire. He studied classical remains in Rome. In 1796 he was appointed a surveyor to the Board of Works and subsequently made president of the Royal Academy. He had an admiration but little understanding of the Gothic style, and his destruction of the Renaissance work, notably in Salisbury Cathedral earned him, from Pugin, the name of 'the Destroyer.' Existing work of his includes Trinity House (1793). His eldest son, Benjamin W. (1775-c. 1850) was responsible for the Duke of York Column near Carlton House Terrace, London, 1830-33.

Wyatt, Sir Thomas (1503-42), Eng. courtier and poet, *b.* at Allington Castle, Kent, and educated at St. John's College, Cambridge. He was one of the most accomplished men of his day and was held in high favour at court. For a time he appears to have shared the disgrace of Anne Boleyn, being imprisoned for a short time in the Tower and afterwards banished to Allington Castle. He was, however, frequently employed later by the king in positions of trust. In 1540 he received a grant of lands at Lambeth and sat in Parliament as knight of the shire for Kent and was named

high steward of the king's manor at Maidstone (1542). His poems were pub. with Surrey's in London (1557), and some of them are remarkable for their grace and elegance. His satires, too, are worthy of mention; but he is chiefly remembered as the pioneer of the Eng. sonnet. In his poetry he is indebted to Chaucer, through whom he harks back to the poetry of medieval England. Some of his lyrics show Fr. influence, though it is rather as the disciple of the Its., Petrarch, Aretino, and Serafino that W. opens a new era in Eng. poetry. See E. M. W. Tillyard, *The Poetry of Sir Thomas Wyatt*, 1929, and K. Muir, *The Collected Poems of Sir Thomas Wyatt*, 1949; also study by E. K. Chambers, 1934. Sir Thomas Wyatt, the younger son of the above (*d.* 1554), saw service at the siege of Landrecies (1544), and ten years later led the Kentish men to Southwark, when the marriage between Mary Tudor and Philip of Spain was being planned. He was captured and executed.

Wycherley, William (1640-1715), Eng. dramatist, *b.* at Clive, near Shrewsbury, the son of a loyal Shropshire gentleman of good family who, on the outbreak of the Civil War, sent W. to be educated in France. On the Restoration W. went to Queen's College, Oxford, and left without a degree; he was then entered at the Temple but preferred a gay social existence and the writing of plays to law studies. His first play, *Love in a Wood*, produced in 1671. This was followed by other comedies: *The Gentleman Dancing-Master* (1671-72); *The Country Wife* (1673), a masterpiece of Eng. comedy only excelled, if at all, by the *The Plain Dealer* (1673 or 1674), which was inspired by Molière's *Misanthrope*. His *Miscellaneous Poems* are forgotten. W. was privately married to the countess of Drogheda, a step that seems to have given offence at court. The marriage, owing to Lady Drogheda's violent jealousy, was unhappy. W.'s plays are all of them ingeniously constructed, the situations are amusing, the characters well drawn, and the dialogue witty and sparkling. He was the moralist of his age, making immorality appear ridiculous, and a thorough misanthrope. He seldom allowed his characters to retain any decency. His reputation has been damaged by Macaulay's essay on *The Comic Dramatists of the Restoration*, but he was sincerely regarded by Pope and Dryden and other men of letters. The best collected ed. of W.'s works is that by M. Summers, 4 vols., 1924. See B. Dobrée, *Restoration Comedy*, 1924, and W. Connely, 'Brawny' Wycherley, 1930.

Wycliffe (spelt also Wyoll, Wiell, Wickliffe, etc.), John (c. 1324-84), Eng. schoolman and reformer, *b.* in Yorkshire, possibly at Hipswell. He studied at Oxford and sometime after 1356 became Master of Balliol College; while there W. accepted a living at Fillingham, Yorkshire (1361), and in the same year appealed unsuccessfully for a papal provision to a prebend at York but obtained a prebend in the collegiate church at Westbury. In 1373 he received a papal

licence to retain his prebend there even after he should have obtained one at Lincoln. He had become a doctor of theology in 1372. In 1374 he became rector of Lutterworth and soon afterwards retired from Oxford, living mainly in Lutterworth until his death.

As Master of Balliol and a prominent Realist, W. took part, on the side of the seculars, in the Oxford controversy between the secular clergy and the mendicant orders (who followed the Nominalist school of philosophy). W. also established himself as a critic of clerical abuses.

In 1374 he was sent to Bruges in the delegation which discussed the question of of papal provisions with papal representatives. After his return he wrote his treatises *De Dominio*. W.'s Realist speculations led him to a belief in predestination, and in the light of this he went on to define lordship. Eventually he decided that the Church had no right to interfere in temporal affairs and denied its right to temporal possessions. Though W. never suggested a spoliation of the Church, such a move was the logical conclusion of his theory, and aroused the hostility of the regular and secular clergy. It fitted conveniently with the views of the Lancelians, for it insisted that lay lords had a right to property although churchmen had not, a proposition in support of which W. had to summon all his resources of scholastic dialectic to avoid being obviously illogical. The general theory may well have had a quite unintended influence in the Peasants' Revolt (1381), since the landless would see no reason to distinguish finely between eccles. and civil lordship.

In 1377 W. was summoned to answer charges of heresy before the bishop of London, but his Lancelian patrons ensured that the meeting ended inconclusively. Bulls were issued against his theories on the relations between Church and State, but seem to have had only negligible effect. He was still supported by his univ., which found him convenient as an additional weapon in its administrative dispute with the episcopal authorities. With the papal schism of 1378, W. took a more revolutionary attitude towards the Holy See, being convinced that its powers were responsible for the disorders of the Church. He challenged the claims of the papacy by asserting that papal decrees were only binding when in conformity with the word of God. Violent attacks on the abuses of sanctuary and pardons (made by the most orthodox) were followed by his *Eng. trans.* of the complete Bible. He began to turn to the Scriptures as the criterion of Christian doctrine, a practice followed by later reformers. His organisation of itinerant 'poor priests' propagated his beliefs. Soon he was questioning the sacerdotal system, and, by 1380, setting aside the doctrine of transubstantiation in the Mass in favour of something approximating to the later Lutheran doctrine of consubstantiation.

This last conclusion branded W. as a heretic. It sprang directly from his

scholastic Realism, and its attendant theory of universals. His heretical views lost him the active support of the Lancelians whose prestige, however, was sufficient to enable him to end his days in peace. They were officially condemned at Oxford, and never seem to have had any considerable following in England. Their violence secured the failure of the more orthodox aspects of his teaching. After his death Lollardy was eradicated from Oxford by Arundel and Courtenay, and with it the last brilliance of the medieval univ.

In England his movement died soon after his death. It survived longest among the poorest classes in the Midland districts. The fall of Oldcastle and a series of burnings under the statute of 1410 apparently suppressed the remnants. In Europe, however, W. influenced Huss (*q.v.*) who, however, never adopted his heretical ideas on the Mass. Through Huss he probably influenced Luther. W. had shown scholasticism to be played out: his extreme conclusions illustrated clearly the practical dangers of hairsplitting dialectic. Though his desire for practical reforms was sincere and justified, he is important largely as a destructive force.

After W.'s example, the Eng. church became afraid of reformers, and viewed the most orthodox suggestions with suspicion. Faithful enthusiasts, from Bishop Pecock to Margery Kempe, were suspected of heresy. Fear of a fresh heretical outburst caused future vernacular trans. of the Bible to be discouraged, and real abuses were allowed to remain. The radicalism of W.'s teaching, therefore, led to a certain crystallisation of Eng. eccles. life, which made the religious revolution, when it came, more sweeping than it might otherwise have been.

See also LOLLARDS. See G. V. Leachler, *Wyclif and his English Precursors* (Eng. trans. 1878); R. L. Poole, *Illustrations of the History of Medieval Thought in Theology and Ecclesiastical Politics*, 1884, and *Wycliffe and Movements for Reform*, 1889; H. Rashdall, *Universities of Europe in the Middle Ages* (vol. ii.), 1895; G. M. Trevelyan, *England in the Age of Wyclif*, 1899; J. Loserth, *Huss and Wyclif*, 1925; H. B. Workman, *Wyclif*, 1926; W. Butler-Bowden (ed.), *The Book of Margery Kempe*, 1936; and H. Maynard Smith *Pre-Reformation England*, 1938.

Wycombe, High, or Chepping, mun. bor. and mkt. tn. in Buckinghamshire, England, at the foot of the Chiltern Hills. Furniture making is the prin. industry and some paper is made. The fine par. church dates from c. 1275, but it was considerably altered and enlarged in the fifteenth and sixteenth centuries. The tn. contains numerous old houses of the sixteenth and eighteenth centuries. The Little Market House was built in 1604 and the Guild Hall dates from 1757. The ruined hospital of St. John dates from c. 1180; it was converted into a grammar school in 1550. Wycombe Abbey, erected by Lord Carrington in 1785, is now a girls' school. Pop. 25,000.

**Wycombe, West**, see WEST WYCOMBE.

**Wye** : 1. Riv. of Wales, which rises in Plinlimmon, and after a course of 130 m. enters the Severn 2½ m. from Chepstow. It has valuable salmon fishery, and is noted in Herefordshire for its beauty. See R. Gibbings, *Coming Down the Wye*, 1942. 2. Vil. in Kent. It has the S.E. Agricultural College and a church rebuilt by Archbishop Kempe in the time of Henry VI. Pop. 1500.

**Wykeham, William of** (1324-1404), Eng. prelate, b. at Wickham, near Fareham. He was educated at the old grammar school at Winchester. W. took deacon's orders at an early age, but was not ordained priest until 1362. In 1364 he became keeper of the privy seal; in 1366 he was elected bishop of Winchester, and in 1367 he became lord high chancellor of England, holding office till 1371. Winchester College and New College, Oxford, were founded by him, the former being finished in 1394 and the latter in 1386; he also rebuilt Winchester Cathedral. W. was a sound administrator, and a keen builder. He was one of the 'curiales-bishops' and was not distinguished as a spiritual leader. See life by G. C. Heseltine, 1932.

**Wyd, Henry Cecil Kennedy** (1870-1945), Eng. philologist and lexicographer, b. of a Scottish family and educated at Charterhouse, Bonn, Heidelberg, and Corpus Christi College, Oxford (1896-99). He was prof. of Eng. language and literature at Liverpool Univ. (1904-20), and subsequently Merton prof. of Eng. language and literature at Oxford. His publs. embrace phonetics, comparative philology, dialects, place names, rhymes, and the like. He also ed. *The Universal Dictionary* (1932).

**Wymondham**, mkt. tn. of Norfolk, England. The magnificent church of St. Mary the Virgin comprises part of the priory founded at W. in 1107, and there is also an interesting old market cross. It is the centre of an agric. area. Pop. 6000.

**Wyndham, Sir Charles (né Culverwell)** (1837-1919), Eng. actor, b. in Liverpool and educated at Sandgate, Bonn, and Paris for the medical profession. In 1865, he appeared in Manchester in the rôle of Charles Surface. In 1870 he toured the U.S.A. in Bronson Howard's *Saratoga*, produced in England in 1874 as *Brighton*. In 1884 the Criterion Theatre was reopened under his management, but in 1899 he left it to open his own theatre, Wyndham's, with *Cyrano de Bergerac*. But his special talents were better adapted either to 'the irresistible young scapgrace or the blithe middle-aged homilist'. Later he opened the New Theatre. He was knighted in 1902.

**Wyndham-Quin, Windham Thomas**, see DUNRAVEN and MOUNT EARL, EARL OF.

**Wynkyn de Worde**, see WORDE, WYNKYN DE.

**Wyntoun, Andrew of** (c. 1350-c. 1420),

Scottish chronicler, was prior of the monastery of St. Serf on Lochleven. He wrote *The Orygynale Cronykil of Scotland*, a work in nine books or cantos, the last four of which are devoted to Scottish hist.

**Wyoming**, mountain, mid-western state of the U.S.A., bounded by Montana on the N., S. Dakota and Nebraska on the E., Idaho, Montana, and Utah on the W., and Utah and Colorado on the S. It is known as the 'Equality State.' W. is part of a lofty plateau of about 6000 ft. above sea-level traversed by mt. ranges, including the whole breadth of the Rocky Mountain system. Its length E. to W. is 365 m., N. to S. 274 m. Area 97,914 sq. m. Gannett Peak, highest point of Wind R. Range, is 13,785 ft. Yellowstone Park is situated in this state, and is noted for its marvellous scenery and geysers. Yellowstone, Bighorn, and Powder Rs. flow E.; Snake R. rises in the N. It has great mineral wealth: coalfields, silver, gold, copper, petroleum, and iron ore. The quarries yield sandstone, limestone, and phosphate rock. Dry farming is carried on. The crops are alfalfa, sugar-beet, vegetables, and small fruits, also apples. Certain varieties of wheat and barley flourish. Stock raising is the most important industry, sheep rearing being third in rank in the U.S.A. Much of the land is forested. The State owns numerous fish hatcheries. Manufs. in W. are not very important, being mainly for local consumption. The most important are petroleum refining, lumber and timber products, dairy products, flour and grain, slaughtering and meat-packing, and a few others. There is a large irrigated area, much desert land being thereby rendered fertile, with 1,486,500 ac. already under irrigation. The climate is good, the atmosphere being clear and dry. There is abundance of sunshine and the State has in consequence become a favourite health resort, particularly for people suffering from lung trouble. There is a state univ. at Laramie. Prin. cities are Cheyenne, the cap. (22,000), Casper (17,000), Laramie (10,600), and Guerdin (10,500). The largest religious body is the Rom. Catholic Church, with the Mormon Church second in numbers. W. was first settled in the seventeenth century by Spaniards. John Coter discovered Yellowstone Park in 1807. In early days there was much fighting with the warlike Indian tribes. There was a great rush of emigrants on discovery of gold in the early 'seventies. W. was admitted to the Union in 1890. It was the first state in the U.S.A. to grant women's suffrage (1869). Pop. (1948), 275,000. See F. B. Beard, *Wyoming from Territorial Days to the Present*, 1933; Federal Writers' Project, *Wyoming*, 1941; V. Linford, *Wyoming: Frontier State*, 1947.

**Wyrtegeorn**, see VORTIGERN.

**Wys, Johann Rudolf** (1781-1830), Swiss author, b. at Berne, see under SWITZERLAND. *Literature*.

## X

**X**, twenty-fourth letter of the Eng. alphabet, may be considered as redundant: indeed, it can well be denoted by the consonants *ks* or *cs*. This letter did not exist in the N.-Semitic alphabet, but when the Gks. took over this writing they had no use for all the Semitic sibilant letters, and having adopted the Semitic *shin* as *s*, they gave it the name *sigma*, which apparently was a transformation of the letter-name *samekh* (perhaps by metathesis, from an Aramaic form, otherwise unknown, *simkha*). The letter *samekh* was adopted in the Theraean and Etruscan alphabets (see under ALPHABET), but in the Ionic alphabet (which later became the classical Gk. alphabet) it was given the phonetic value of *x* (*ks*) and the name *xei*. According to some scholars, however, the Gk. *xei* had not the phonetic value of *ks*, but was merely a guttural aspirate, equivalent perhaps to Scottish *ch*. After the Romans adopted the Etruscan alphabet (which had no *x*) they added **X** to represent the sound *ks*, placing it at the end, for it did not then include *y* and *z*. The **X** passed with the other Lat. letters into the Eng. alphabet, where it retains the same sound (*ks*). The interchanges of *x* with other letters are as follows: (1) *x* with *c*, as in the double form of the Lat. or Gk. preposition *ex* or *ec*; (2) *x* with *sc* or *sk*; (3) *x* with *g*, as in Lat. *augeo* compared with the Gk. *αἰσάω*; and *μύ-ωμι* compared with *μι-ε*, Eng., and *μι-ε-ω*, Lat.; (4) *x* with *ps*, as the Lat. *crilis* compared with the Gk. *ψιλος*. In chemistry, **Xe** is the symbol for one atom of xenon.

**Xanten**, tn. of Germany, on the Lower Rhine, 35 m. below Düsseldorf. The Ger. legends describe **X**. as Siegfried's birthplace. It was the Rom. Vetera Castra. St. Victor and his followers were martyred in **X**., and St. Norbert was b. here c. 1083. It was a flourishing city in the thirteenth century. There are sev. Rom. remains, and some fine Gothic churches. **X**. suffered heavy damage during the Second World War. Pop. 4800.

**Xanthine** (2, 6, dioxypurine),  $C_4H_4N_4O_6$ , uric acid or purine derivative, is a white powder, slightly soluble in water. It occurs in the blood, in urine, and in tea, and may be prepared by reducing uric acid with sodium amalgam.

**Xanthus**, anct. city of Lycia. It stood on the W. bank of the riv. of the same name. Twice in the course of its hist. it sustained sieges, which terminated in the self-destruction of the inhabs. with their property, first against the Persians under Harpagus, and afterwards against the Romans under Brutus. The city was never restored after its destruction on the second occasion. **X**. was rich in

temples and tombs, and other monuments of the most interesting character.

**Xávea**, see JAVIA.

**Xavier, Francis, Saint** (1506-52), Sp. Jesuit missionary and saint, 'the Apostle of the Indies,' b. at the castle of Xaviro, near Sanguesa, in Navarre. At the Univ. of Paris he met Ignatius Loyola, with whom he was associated in the formation of the Society of Jesus (1534). He was ordained in 1537, and for some years preached in Rome. In 1540 he sailed for the W. Indies as a missionary. After having made converts in Goa, Malacca, Travancore, the Banda Is., the Moluccas, and Ceylon, he founded a mission in Japan (1549-51), where, forty years after his death, it has been estimated that there were 400,000 Christians. For a long time he was forbidden to enter China, and he d. at Sanchian, near Canton, when he had at last received permission to preach in China and was on his way to found a mission there. He was one of the greatest of all missionaries: he was favoured with mystical experiences, yet was capable in practical affairs, and seems to have had a most kindly and gentle personality. **X**. was canonised in 1622. His feast-day is on Dec. 3. His letters were pub. in 1631. See lives by Mary McClean, 1896, and E. A. Stewart, 1917.

**Xenon** (the stranger), symbol **Xe**, atomic number 54, atomic weight 130.2, heaviest of the argon group of inert gases, obtained by Ramsay by the fractional distillation of liquid air. It is present in the atmosphere to the extent of one part in twenty millions. The spectrum of **X**. shows prominent red and blue lines in the intermittent discharge, but with the 'jar' discharge green lines take the place of the red and blue.

**Xenophanes** (fl. 540-480 B.C.), Gk. philosopher and poet, the founder of the Eleatic school. He was b. at Colophon in Ionia, but settled in Elea, S. Italy, where he wrote sev. elegiac poems, and one poem in hexameters on nature, of which fragments remain. See T. Bergk (ed.), *Lyrici Graeci*, 1900.

**Xenophon** (c. 435-354 B.C.), Gk. historian and Athenian general, b. at Athens. He was a friend and disciple of Socrates. In 401 **X**. entered the service of the Persian prince, Cyrus the Younger, who was fighting his sovereign and elder brother Artaxerxes Mnemon. The Gk. officers were treacherously killed after the Battle of Cunaxa, and **X**., with great courage and skill, led the retreat from the Tigris to Trapezus, on the Black Sea. A hist. of the expedition is given in his *Anabasis*. He enlisted his soldiers in the service of Lacedaemon. In 399 **X**. was banished from his home, either on account of his Spartan sympathies, or because of his

friendship with Socrates. In 396 he joined the Spartan army, and fought under King Agostlaus at Coroneia (394). He was rewarded with an estate at Scillus. After the renewal of an alliance between Athens and Sparta (371), the decree of banishment against X. was repealed, and he is said to have lived for the rest of his life at Corinth. Besides the *Anabasis*, he wrote a life of Agostlaus; *Hellenica*, a hist. of Greece from 411 to 362 B.C.; *Memorabilia*, *Apologia*, *Economicus*, and *Symposium*, all of which are expositions of the teachings of Socrates and attempts to vindicate his old teacher and friend; *Hiero*, a dialogue on tyranny; *Cyropædia*, a political romance; *On Horsemanship*; *Hipparchicus*, on the responsibilities and powers of a cavalry officer; *Cynegeticus*, on hunting; *The Lacedæmonian Constitution*; and *The Athenian Revenues*. There have been many Eng. trans. of his best-known works, including a complete one by H. G. Dakyns (1890-94). For text see ed. by E. C. Marchant, 1920. See also J. B. Bury, *Ancient Greek Historians*, 1909; L. V. Jacks, *Xenophon, Soldier of Fortune*, 1930; and C. Colin, *Xenophon, historien*, 1933.

**Xeres**, see JERÉZ DE LA FRONTERA.

**Xerxes**, King of Persia (485-465 B.C.), b. c. 519 B.C., son of Darius Hystaspes and Atossa, daughter of Cyrus the Great. His ambition was to conquer Greece, and with this end in view he organised a vast army, which he led across the Hellespont on a bridge of boats (480). Another great feat was the construction of a canal through Mt. Athos. He marched S. without meeting resistance until he reached Thermopylæ, where he defeated Leonidas and his handful of Spartans. X. then marched through Phocis and Bœotia and at length reached Athens, while his fleet, battered in storm and action, arrived in the bay of Phalerum. He destroyed Athens and then decided to risk a naval battle with the Athenians, but his mighty armament was defeated and dispersed at Artemisium and Salamis (480). Fearful now for his own safety he left Mardonius (q.v.) with a large army to complete the subjugation of Greece and, with the rest of his force retreated homewards, entering Sardis at the end of the year (402). In 479 Mardonius was defeated at Platæa by the Gks. and at the same time the Persians were also defeated at Mycale in Ionia. X. was assassinated by Artabanus in 465.

**Ximena**, see JIMENA.

**Ximenes** (or Jimenes) de Cisneros, Francisco (1436-1517), Sp. cardinal and statesman, b. at Torrelaguna in Castile. He studied at Alcalá de Henares, Salamanca, and Rome, and was ordained priest. In 1480 he was appointed grand-vicar of Sigüenza by Cardinal Mendoza. Two years later X. took Franciscan vows, and became confessor to Queen Isabella in 1492. The queen appointed him archbishop of Toledo in 1495, and on her death he was appointed regent (1506) to the mad Queen Joanna. He founded the Univ. of Alcalá de Henares (c. 1498), organised the preparation of a new Poly-

glot Bible (1514-17), and did his utmost to reform monastic life. In 1507 he became a cardinal, and in 1509 led in person an expedition against Oran in Africa. On the death of Ferdinand he again acted as regent (1516-17). See Gomez de Castro, *De Rebus Gestis Francisci Ximenii* (1569). See also lives by J. Ulrich, 1883, and J. P. R. Lyell, 1917.

**Xisuthros**, see ZIUSUDRA.

**Xochimilco**, tn. of Mexico, 12 m. S.S.E. of the cap., with Aztec remains. Its floating gardens are famous. Pop. 12,000.

**X-Rays** were discovered by Röntgen (q.v.) in 1895 during some experiments on the subject of electric discharges through highly evacuated tubes. He was investigating the ultra-violet light produced by such tubes, and he employed a fluorescent screen covered with barium platino-cyanide in order to detect the presence of the ultra-violet light. He discovered that his screen continued to fluoresce even when the discharge tube was completely covered with opaque paper; further, he found that heavy objects interposed between the tube and the screen stopped the fluorescence. It was clear, then, that some kind of radiation was emitted from the tube that could penetrate opaque paper and cause the screen to fluoresce, and that this radiation was absorbed by heavy objects. Being ignorant of the nature of this radiation, Röntgen called it X-rays.

*Methods of Production.*—Intensive research on X-rays followed Röntgen's discovery, and the best method of producing these rays was gradually evolved. Until 1913 the most satisfactory X-ray bulb was of the design shown in Fig. 1.

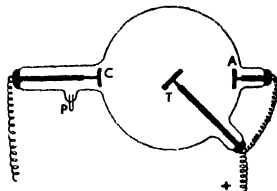


FIG. 1

EARLY DESIGN OF X-RAY BULB

C is the cathode, made of aluminium, concave in shape in order to focus the cathode rays (q.v.) on the metal plate T, known as the target. This target is the anode, but it is found that the discharge takes place more steadily when there is a second anode A present. The target is the source of the X-rays, and as it gets very hot it is made of a metal such as tungsten which has a high melting-point. The tube is fairly highly evacuated, requiring a potential difference of about 40,000 volts between the anode and the cathode in order to produce a discharge. The source of this potential difference is the secondary of a transformer or induction coil, the primary of which is connected to a battery of a few accumulators.



In course of time the residual gas is occluded by the glass walls and in order to restore the tube to its former condition the palladium tube *P* is gently heated by means of a Bunsen burner. The palladium tube is gas-tight when cold, but lets hydrogen through quite freely when hot, so that traces of free hydrogen in the Bunsen flame find their way inside the bulb. This type of tube is still widely used, but for such purposes as deep X-ray therapy it has been displaced by the Coolidge bulb, which is vastly superior to its predecessor, both in point of steadiness of running and in the 'hardness' or penetrating power of the X-rays it emits.

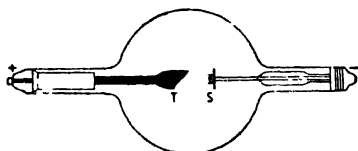


FIG. 2  
THE COOLIDGE BULB

The Coolidge bulb, invented in 1913, is shown in Fig. 2. The tube is highly evacuated, the pressure inside being of the order of  $10^{-5}$  mm. of mercury. The source of the electrons is the flat spiral *S* of tungsten that is heated by means of a small battery of accumulators. The spiral is surrounded by a short tube of molybdenum and this serves to focus the cathode rays on the adjacent target *T*. The latter is made of tungsten and is solid, so that the danger of overheating through the impact of the electrons is minimised. The great advantage of the Coolidge bulb over the older type lies in the fact that the source of electrons is independent of the potential difference between the anode and the cathode. Thus the stream of electrons can be increased or decreased by increasing or decreasing the current through the spiral, while the hardness of the X-rays can be increased by increasing the potential difference between the anode and the cathode. The most satisfactory source of potential difference is a transformer working with an interrupter, and a potential difference of about 70,000 volts is commonly used with these tubes.

**Nature and Properties.**—X-rays are electromagnetic waves, identical in character with wireless waves and light waves, but differing in degree, being extremely short waves. The softest or least penetrating X-rays have wave-lengths of the order of  $2 \times 10^{-8}$  cm., while the hardest rays produced by the Coolidge bulb are as short as  $6 \times 10^{-10}$  cm. Their peculiar properties are due to the fact that their wave-lengths are so minute. They can penetrate bodies opaque to ordinary light because the distance between the atoms of the body is of the same order as the wave-length of the X-rays (see DIFFRACTION). The absorption of X-rays by bodies depends on the nature of the atoms of

which the body is constituted; the heavier the atoms the greater the absorption of X-rays. A thin sheet of lead, for example, will absorb an appreciable amount of a hard beam of X-rays that will penetrate sev. ft. of wood. A beam of X-rays passing through a human body is less readily absorbed by the flesh than by the bone; hence if a fluorescent screen is placed behind the body the bones will be revealed by the 'shadows' they cast on the screen that is illuminated more intensely behind the fleshy parts. Permanent X-rays records of an examination are obtained by replacing the fluorescent screen by a photographic plate which is sensitive to X-rays. The modern Coolidge bulbs reveal the internal structure of the human body in great detail. Closer examination of the organs is achieved by making the patient consume food containing salts of bismuth or barium, as these are relatively opaque to X-rays.

**Radiotherapy.**—Skin diseases such as acne and ringworm have long been successfully treated by X-rays. Living cells are not so easily destroyed by X-rays as the malignant ones, and in the hands of an experienced radiologist there is no danger attached to radiotherapeutic treatment. Deep-seated growths are successfully treated by the penetrating X-rays emitted from modern bulbs. Cancerous growths have yielded to this treatment, yet many failures indicate that X-rays do not form a specific defence against this disease. Undoubtedly the explanation of the therapeutic value of X-ray treatment is that X-rays, in ejecting electrons from the atoms of a substance through which they pass, cause a transmutation followed by the decay of the malignant cells. In this they produce similar effects to the even harder  $\gamma$ -rays of radium (*q.v.*).

**Origin of X-rays.**—The question of the origin of X-rays is closely related to the problem of the structure of the atom. These problems have been the subject of continuous intensive research for over thirty years and contributions to the subject have been made by almost all the famous physicists of to-day. The X-rays are generated by the impact of the high-speed electrons on the target of the X-ray bulb. If such an electron penetrates an atom of the target and is deflected by the nucleus (*q.v.*) of the atom, it cannot take up a permanent residence in one of the inner electronic orbits of the atom, since these are already occupied, unless another electron is ejected. Two things may happen: (a) the electron may take the place of one of the electrons already in an inner orbit; (b) it may itself escape with reduced energy after its collision. The remainder of its energy appears as X-radiation; the effect is really a reversal of the photo-electric effect. The greatest possible frequency of the X-radiation emitted occurs when the electron escapes with zero energy; the quantum theory (*q.v.*) then tells us that the frequency of the X-radiation is given by the equation  $h\nu = mv^2$ , where  $m$  is the mass of the electron,  $v$  its original velocity on impact, and  $\nu$  is the frequency

of the X-radiation;  $h$  is Planck's constant (see QUANTUM THEORY). This result agrees with experimental determination of the wave-lengths of X-rays by measuring the diffraction caused when the X-rays pass through a crystalline substance.

**X-ray Spectroscopy.**—It has been pointed out that the wave-lengths of X-rays are very short, and in these circumstances no system of lenses or prisms could be used to produce reflections or refractions for them. In 1921 von Laue suggested that a crystal would act as a diffraction grating for X-rays. A crystal is a conglomeration of atoms arranged on a regular plan at extremely short distances apart—so short indeed that one would naturally expect them to show diffraction for very short waves. The method developed by von Laue in Germany was improved by W. H. and W. L. Bragg in England, and much knowledge has been acquired concerning X-ray spectra as well as important information on the structure of crystals. Assuming that a beam of X-rays falls on a crystal and passes through it, it can then be recorded on a photographic plate which shows the diffraction pattern which can be studied by a number of methods. Measurement of X-ray wave-lengths are effected by the rotating crystal method, originated in 1913 by the Braggs, by the powder photograph, the X-ray spectrometer, the Laue photograph, etc., but a description of these is impossible in the limited space and readers should refer to specialised text-books for further information on the subject.

**Industrial Applications of X-rays** are almost unlimited in their range. Wherever and whenever it is highly important to probe the interior of a finished article of manufacture without damaging it in any way, recourse is made to X-ray examination. Hidden fractures in metal castings or weldings; internal faults and flaws in timber for aeroplanes, etc.; defective golf balls and glass; the discrimination between real and artificial gems; the examination of leather and the fit of boots and shoes, all these are revealed by routine X-ray examination, while fraudulent paintings alleged to be 'old

masters' are detected at once by such an examination that has also proved its value in detecting alterations to genuine masterpieces. See G. W. C. Kaye, *X-rays*, 1917, and *Practical Applications of X-rays*, 1922; W. H. and W. L. Bragg, *X-rays and Crystal Structure*, 1924; 1927; W. L. Bragg, *Atomic Structure of Minerals*, 1937; and H. G. Cooper, *Scientific Instruments*, 1946.

**Xucar**, see JUCAR.

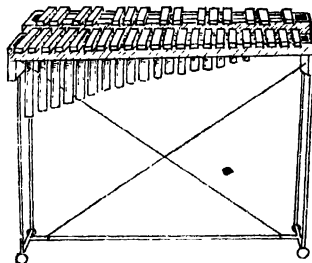
**Xylography**, see BLOCK-BOOKS.

**Xylol**, commercial name given to the mixture of xylenes obtained from coal-tar. Xylene, or dimethylbenzene,  $C_6H_4(CH_3)_2$ , exists in orthometa-, and para-isomeric forms and the three are similar in physical properties (boiling point  $138^{\circ}$ - $143^{\circ}$  C.).

**Xylonite**, see CELLULOID.

**X Y Z Correspondence.** President Adams of the U.S.A. used this term in the Congress reports for the letters of Marshall, Pinckney, and Gerry, who were ambas. to Talleyrand in France.

**Xylophagidae**, family of flies which suck the juices of plants and the sap of trees.



XYLOPHONE

**Xylophone**, percussion instrument with a series of wooden sticks or plates tuned in a chromatic scale ranging from middle C about 3 octaves upwards in foreign instruments, but in Eng. ones often only from B $\flat$  flat above middle C. It is played with mallets and makes a dry, rattling but perfectly clear and richly sonorous sound.

# Y

**Y**, twenty-fifth letter of the Eng. alphabet, has here the phonetic value of a consonantal *i* : with this sound it is familiar to the Eng. as the beginning of words, as in *yes, young, yoke*. This sound, however, was written in Lat. by *i*, e.g. *iugum* or *IVGVM*, but when transliterated in modern letters, this *i*-consonantal sound is not represented by *i* or by *y*, but by *j* : *iugum* or *IVGVM* is now written *jugum*. A further complication arises in Eng. when the sound *y* is followed by a long *u* : the letter *y-j-i* is then omitted, and we write *union, unity, useful*.

There was no **Y** in the N.-Semitic alphabet. When the Gks. borrowed it they transformed a form of the Semitic *waw* into the vowel *u*, which they called *upsilon*, but pronounced it like the Fr. *u* or the Ger. *u*. The Etruscans took over the *upsilon* (then having the form *V*) as the vowel *u*, and passed it over as such to the Romans, who used it, however, as *v* or *u*. After the Rom. conquest of Greece (first century B.C.), Gk. words were largely borrowed by the Lat. language and the symbol **Y** was adopted for the Gk. sound *u-y* from the contemporary Gk. alphabet in order to transliterate Gk. words ; it was placed after the letter *X*. Thus the words in which the *y* occurs are not really part of the Lat. language, but are borrowed from the Gk., e.g. *zephyrus*. Such forms as *lachryma, hyems, sylva* are errors of modern editors. The Romans themselves wrote *lacruma* or *lacruma, hems* or *hemps* and *sylva*. In A.-S. the sound of a *y* was commonly represented by an *e* before *a* or *o*, and by an *i* before *e* or *u*, in which cases the allied languages of Iceland, Denmark, and Sweden for the most part employed a *y*. In chemistry, **Yb** and **Yt** are the atomic symbols of the metals ytterbium and yttrium, respectively.

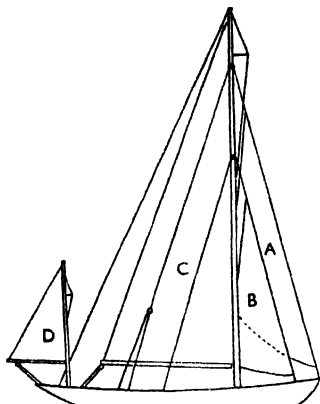
**Yacht**, generally a vessel used for pleasure-cruising or racing. The first Brit. **Ys.** were the *Mary* and *Bezan*, both presented to Charles II. by the Dutch at his Restoration. Eng. shipwrights were at once set to improve on the Dutch models and were able to do away with the Dutch lee-boards and build **Ys.** of deeper draught. On Oct. 1, 1661, Pepys, an early convert to yachting, tells how Charles, in the new *Katherine*, raced with the duke of York, in the new *Anne*, from Greenwich to Gravesend and back for a wager of £100, the first recorded **Y. race** sailed in Eng. waters. Soon other wealthy men began to own **Ys.** In 1720 the first **Y. club** was founded in Cork, and in 1775 the Cumberland Fleet, or Sailing Society, was founded, the ancestor of the present Royal Thames **Y. Club**. Gradually there have evolved types of craft, moderate in size and capable of travelling all over the world. **Ys.** fall naturally into two

classes, viz. sailing **Ys.** and power-driven **Ys.**, sailing **Ys.** being capable of further subdivision into cruising and racing types. Power-driven vessels are the more costly to buy but are more easily handled and are used mainly for cruising. Steam-engines were the first mechanical means used for the propulsion of **Ys.**, but the introduction and development of the internal combustion engine have been responsible for their replacement by engines of the latter class. Small vessels now being constructed are, as a rule, driven by petrol or paraffin engines, whilst **Ys.** of the larger sizes are almost invariably engined by 'Diesels' or 'Semi-Diesels.' When sailing **Ys.** are designed for cruising it is usual to instal an auxiliary engine for use when entering and leaving harbour or when conditions are unsuitable for sailing.

Sailing vessels are described by the manner in which they are rigged. Today the old-fashioned gaff mainsail is seldom used by either racing or cruising **Ys.** Instead almost all sailing **Ys.** have tall masts and tall narrow triangular mainsails, which offer a long leading edge of sail to the wind and are very efficient for windward work. Modern **Ys.** too are generally without a bowsprit and set a variety of headsails from the stem head, which are graded according to the strength of wind and conditions of sailing. As well as jib and forestaysail, Eng. **Ys.** set a Yankee (masthead jib, once called a jib-topsail) and a Genoa (large jib of light canvas) ; and both these sails can be sheeted home and used for windward work. A parachute spinnaker is set when running before the wind, it is the shape of an isosceles triangle, and is hoisted before the forestay and has a short spinnaker boom which is hooked into the appropriate clew, or lower corner, according to the side on which the sail is to be carried. To combine lightness with strength, masts and spars are hollow, and masts are carefully stayed. Nylon is beginning to replace hemp, cotton, and flax for both rope and sails. The commonest rig for Brit. **Ys.** is the cutter, which has a single mast, and whose working canvas consists of a mainsail, forestaysail and jib. Yawls and ketches add a small mizen mast, stepped in the stern abaft the mainmast, in the yawl and before the sternmost in the ketch. Larger sailing **Ys.** are rigged as schooners, with two or more masts. In the schooner the mainmast is the aftermost of the two masts, is stepped nearly amidships and is a taller mast than the foremast. Schooners have bermudan or gaff mainsails but often carry staysails, in place of bermudan or gaffsail, between the masts.

In 1875 the **Y. Racing Association** was

estab. to govern the conditions of racing. Since that date Y. racing has become increasingly a popular sport and racing Ys. have undergone many changes. We have already noticed the general adoption of the bermudan rig; equally noticeable is the much smaller average size of racing Ys. Rising building costs and improvements in design, necessitating frequent new building if an owner is to remain successful, have encouraged smaller Ys.



YAWL.

A, jib, B, staysail; C, mainsail; D, mizzen.

Thus many of the bigger classes, as was the J-class, which included King George V's *Britannia*, have now been either entirely or virtually abandoned. Yet racing in the smaller classes is so keen that probably the sport has never before attracted so many amateurs. Indeed there are so many one-design classes in use round the coast that it is only possible to mention those which have a national or an international status. The lightest racing crafts are the sailing canoes, but their numbers are few compared with the dinghies. Three large classes are the International 14 ft. dinghy class, the National 12 ft. dinghy class and the National Firefly 12 ft. one-design dinghy class. As well as being comparatively inexpensive and easy to maintain in racing trim, these dinghies give superb sport and school first-class helmsmen and helmswomen. Larger racing Ys. recognised by the International Y. Racing Union and popular in this country are the International 6 metre class and the International Dragon One-Design class.

In recent years a new form of Y. racing has attracted more and more attention and is known as off-shore or ocean racing. The yearly programme caters for different sizes of Ys. and the courses are of various lengths. Typical courses are from Harwich to the Hook of Holland, Cowes to Dinard and St. Malo, Plymouth to La Rochelle, and from Portsmouth round

the Fastnet and back to Plymouth. These races test seamanship, navigation, and Y. construction in all weathers. Although special Ys. are built for this ocean racing, and the Royal Ocean Racing Club have rating rules, it is still possible for cruising Ys. to win events and, indeed, cruising Ys. and ocean racing Ys. cannot be treated separately. A remarkable feature of recent years has been the number of small cruising Ys. which have been sailed by amateurs across the Atlantic, or home from the E. across the Indian Ocean and up the Red Sea and through the Mediterranean, or right round the world.

Many handsome, comfortable, and seaworthy motor cruising Ys. will be found all round the coast. Some are conversions and others are standard types. Popular for family summer holidays are the so-called fifty-fifty, which are motor-boats with roomy accommodation and carrying sufficient sail so as to be able to make passages under sail alone in fair winds.

See F. B. Cooke, *Single Handed Cruising*, 1931; E. G. Martin, J. Irving, and others, *Cruising and Ocean Racing*, 1933; K. A. Coles, *Sailing Days*, 1944; P. Heaton, *Sailing*, 1949; B. Hockstall-Smith and E. du Boulay, *The Complete Yachtsman*, 1949; E. C. Hiscock, *Let's Go Cruising*, 1949; and J. H. Illingworth, *Offshore, A Complete Introduction to Ocean Racing*, 1949.

Yadar, see JADAR.

Yag, see OB.

Yahgans, see under FUEGIANS.

Yahweh, see under JEHOVAH.

Yahwist, see JAHVIST.

Ya'navalkya (fl. c. 350), Hindu sage. He was responsible for a code of laws which is regarded by the Hindus as one of the sacred books.

Yak, or Grunting Ox (*Potaphagus grunniens*), large Tibetan ox which exists both in the wild and domesticated state. Two of its chief characteristics are the fringe of long, pendulous hair along each flank and the huge whisk of hair at the end of the tail. In summer the coat is a deep, rich brown; the horns are black, large, and strong. The distinction between wild and domesticated Ys. is the grey hair on the nostrils of the former. They can live at very high altitudes, and the domesticated animal is used as a beast of burden and yields milk and meat.

Yakima, city of Washington, U.S.A., cap. of Y. co., on the riv. Y. It is the centre of an agric. area, converted from desert by irrigation. There are canning and timber manufs. Pop. 27,200.

Yakuts, race inhabiting the Yakut A.S.S.R. of the R.S.F.S.R. They are a northern branch of the Turkish race who came into E. Siberia about the beginning of the fourteenth century. The Ys. are chiefly a pastoral people. The Evenki (Tungus) tribes still follow their traditional occupations of hunting and trapping fur-bearing animals, and hunt the wild deer and elk and mt. ram for food. The Ys. are also traders. They number about 300,000. See H. Jochelson, *The Yakut*, 1933.

**Yakutsk**, or the **Yakut A.S.S.R.**, autonomous republic in the R.S.F.S.R., in E. Siberia. The Arctic Ocean is its N. boundary. It has an area of about 1,454,830 sq. m. In the S.E. is a densely wooded plateau, whose animals are of great commercial value on account of their fur. The forests still remain practically untouched, though the lumber industry has been developed under the Five Year Plans. The most important rivs. are the Lena and its affluents, the Olonok, Yana, and Indighirka. The winters are Arctic: summers hot. The prin. industries are hunting and gold-mining. Silver- and lead-bearing ores and coal are worked. There is also a trade in salt due to the large deposits of sodium chloride. There are pig-iron foundries and timber industries. Y. has been much developed since 1917, and railways have been built. Pop. 400,500.

The chief tns. are Yakutsk, the cap., and Vilusk. Yakutsk is situated on the R. Lena. It was estab. as a fortified Cossack station in 1632. It has saw-mills and wood-working plants, and is the agric. centre for the whole region embracing the basins of the Lena and its tribs., and is the chief collecting centre of the fur and mammoth ivory trade. Pop. 25,000.

**Yale, Elihu** (1649-1721), patron of Yale Univ. (q.v.). He was b. at New Haven, Connecticut, entered the service of the East India Company (1672), and became governor of Fort St. George, Madras (1687). He gave £800 and books to the collegiate school at New Haven, and the whole univ. was called after him. He is buried at Wrexham, Wales.

**Yale University**, one of the two oldest and most famous univs. in the U.S.A. (the other being Harvard) is situated at New Haven, Connecticut. It was founded by ten Connecticut Congregational ministers with a gift of books at Branford, Connecticut, in 1701, and was first called the Collegiate School of the Colony. In 1718 it removed to New Haven and became Yale College, taking the name of Elihu Yale (q.v.) its first great benefactor. More books were secured for it by Jeremiah Dummer, the Colony's agent in London: Bishop George Berkeley gave his valuable library and his farm in Rhode Is. The rent from it provided the young college its first funds for study beyond the bachelor's degree. Its first permanent building, Connecticut Hall, was erected in 1752 and still stands. Schools of medicine, law, and divinity were estab. in the early nineteenth century, and at the same time Benjamin Silliman began his pioneer work in the teaching of science. The first art gallery connected with a college in America was built at Yale in 1832, where John Trumbull's paintings of the Revolutionary War are housed. The Ph.D. degree was first granted in America by Yale in 1861. The schools of fine arts, music, and forestry came later; a School of Nursing (for women) was estab. in 1923 by gifts of the Rockefeller Foundation.

Undergraduates as freshmen (about 1000) live together on the Old Campus.

In their three upper class years they live in ten residential colleges, each accommodating 250 to 300. This residential college plan, preserving in a large univ. the values of a small college, was made possible by the gift of Edward S. Harkness ('97), in 1930. The bequest of John W. Sterling ('64), in 1918 provided many professorships and scholarships and buildings, notably those for the schools of medicine, law, and divinity, and the Sterling Memorial Library. The Yale Library, with nearly 4,000,000 vols., is one of the great libraries of the world, especially strong in Amer., Eng., and Ger. literature, linguistics, the hist. of medicine and of the church. There are famous collections in the Art Gallery and the Peabody Museum of Natural Hist. Before the Second World War there were 5300 candidates enrolled for degrees and a faculty of 1000. After the war the number of students reached nearly 9000 and the faculty 1400. Both figures are now somewhat less. Women are not admitted to the undergraduate schools but may become candidates for degrees in any of the graduate and professional schools in the univ.

Yale and Harvard athletic contests began with boat races in 1852 and have continued regularly since then except during wars. The Payne Whitney Gymnasium has facilities for many kinds of competitive sport. Yale alumni are especially well known as first presidents of American colleges—Princeton, Dartmouth, Columbia, and many others. There were twenty-four Yale members of the Continental Congress and four Yale signatories to the Declaration of Independence. The endowment of the univ. in 1949 was \$129,599,341.

**Yalta**, tn. of the R.S.F.S.R., in the Crimea Region, 35 m. E. of Sevastopol. It has a mild, healthy climate. The tsars and nobles of the imperial regime built here a beautiful community of old palaces and villas. These have been converted by the trades unions of the various commissariats into institutions and the area around Y. is now one of the chief centres for Soviet rest-homes and sanatoria. In Feb. 1945, Mr. Churchill, President Roosevelt, and Marshal Stalin, met at Y. to make plans for the final defeat of Germany and the occupation and control of the country and generally to co-operate for future world peace. See E. R. Stettinius, *Roosevelt and the Russians*, 1950. Pop. 30,000.

**Yalu**, riv. of Asia which forms a boundary line between Korea and Manchuria. It rises in Paiktu-san, and after a course of 300 m. empties itself into Korea Bay, near Wiju. It was the scene of several skirmishes during the Russo-Jap. war (1904).

**Yam**, edible tuberous root of many species of *Dioscorea*, and much grown in tropical countries, where it takes the place of the potato. Some species yield tubers of enormous size.

**Yama**, in Hindu mythology, judge and ruler of the departed. He is represented as of a green colour, with red garments

crowned, four-armed, and sitting on a buffalo. He holds a club and noose, with which the soul is drawn from the deceased's body.

**Yangtzekiang**, riv. of China, the greatest in the country. Its source is in the Tang-la Mts. of the Kuen-lun system in Central Tibet. It originates in a number of dashing torrents which are more than 16,000 ft. above the sea-level. It flows in an easterly direction through the prov. of Yunnan, and turning N. forms part of the boundary line between that prov. and Szechwan. At this stage in its course it receives the waters of the Ya-long-kiang from the N., and the Hsiao Nan-kiang and K'ikiang from the S. Having a tortuous course, bending in an E.N.E. direction, it waters the provs. of Szechwan, Hupeh, Kiangsi, Hunan, Anhwei, Kiangsu, and finally empties itself into the Yellow Sea. Its chief tribs. in China not already mentioned are the Mu Ho, Takiang, Kia-hu, and Han from the N., and the Wu from the S. The total length is some 3500 m., of which 1500 are navigable by native rafts. The area drained by the Yang-tse is estimated at over 689,100 sq. m. The chief tns. on its banks are: Chungkiang, Hankow, Wu-chang, Nanking, and Chinkiang.

In July 1949 there occurred on the Y. the daring exploit of the Brit. sloop *Amethyst*. The sloop was attacked in April by Chinese Communist artillery on the Y. while sailing to Nanking on a humanitarian mission on behalf of the foreign community, and suffered heavy damage and casualties. Her commanding officer was killed. The Communist military authorities refused to give the sloop a safe conduct unless Lieutenant-Commander Kerans signed a document admitting Brit. responsibility for the incident. This was unacceptable and the sloop was then detained for three months under almost intolerable conditions. At the end of July the *Amethyst* shipped her moorings in defiance of her gaolers, and successfully overcoming more than 140 m. of navigational hazards on a pitch-dark night without a pilot, reached the open sea without sustaining casualties in spite of opposition from shore batteries.

**Yanina**, see JANINA.

**Yankee, or Yank**, term often loosely used in modern Europe for anyone b. in the U.S.A. During the War of Independence it was derisively applied by Brit. soldiers to the New Englanders. During the Civil war it was applied by the Confederates to the Union troops, and, as such, is still resented by Southerners if applied to them. Its origin is uncertain. It has been suggested that it derives from the Old Dutch *Janke*, or was a corruption of *English*, adopted by the New England Indians.

**Yaounde, or Yaunde**, cap. of the Fr. Cameroons. It is connected by rail to the coast. Pop. 50,000.

**Yap**, see under CAROLINE ISLANDS.

**Yapock** (*Chironectes variegatus*), S. American marsupial about the size of a rat and with webbed hind feet. It is aquatic in habit.

**Yapurá, or Japurá**, riv. of Colombia and Brazil. It rises in the Colombian Andes as the Caquetá and flows E. into Brazil, joining the Amazon near Toffe. Length, 1500 m.

**Yard**, Brit. measure of length, equalling 3 ft., or 36 in., being the standard. The length of the arm of King Henry I. was made the length of the *ulna* or ell, which answers to the modern yard. See ELL; WEIGHTS AND MEASURES.

**Yare**, riv. of Norfolk, England, which empties into the sea at Yarmouth. Length 50 m.

**Yarmouth**: 1. (correctly **Gt. Yarmouth**), co. bor., seaside resort, and port of Norfolk, England, 20 m. E. of Norwich and 122 m. from London. Y. has a good harbour at the mouth of the Yare, with ship-building yards. The fisheries are a prominent industry, the chief fish caught being herring, mackerel, cod, and white fish. Notable buildings include a modern tn. hall; the remains of the cloisters of a monastery and the walls; while other old features are the fishermen's almshouses and the Blackfriars Tower. On the S. Denes is the Nelson monument, a column 144 ft. high. It was on the jetty in the centre of the Marine Parade that Nelson landed after the battle of the Nile. Characteristic of the old tn. are the 'rows', a number of narrow lanes often only a few ft. wide, some of which were destroyed during the Second World War. Fishermen from the Cinque Ports made a permanent settlement there. The famous Tollhouse in Middlegate Street, which was used as a library museum, was destroyed by Ger. aircraft in 1943. The par. church of St. Nicholas, founded in 1101 and the largest in England, was gutted by fire in an air-raid in 1942. There are two piers, and a racecourse. Gorleston-on-Sea, part of the bor., is situated on the other side of the R. Yare and it is at Gorleston that the riv., which runs through the port of Yarmouth, flows into the sea. There are Rom. remains at Burgh Castle. The High Stewardship is an anct. office of the bor. of Y. In former times the High Steward presided as judge in the bor. court and performed the duties which now devolve upon the Recorder. Y. was bombarded by Ger. warships in the First World War. The tn. suffered heavy damage from air-raids during the Second World War, and the death roll was high. Since the end of the war efforts have been made with considerable success to attract light industries to the tn., and sev. housing schemes have been initiated. Pop. (estimated, 1950), 52,600. 2. A small seaport on the N.W. coast of the Isle of Wight, 10 m. W. of Newport, on the mouth of the Yare. There is good yachting. Pop. 900. 3. The cap. of Yarmouth co., Nova Scotia, Canada, on the Bay of Fundy. It has shipbuilding yards, fisheries, and manufs. of machinery, boots, cotton goods, etc. It is a holiday resort. Pop. (estimated) 8000.

**Yarmouth Roads**, roadstead in the N. Sea, off Norfolk, England, affording fairly safe anchorage.

**Yarn**, spun fibres ready for being woven

into cloth. When the fibres are simply twisted together, the material is known as single Y. Cotton Y. is counted by the number of single hanks of 840 yds. each in 1 lb. (avoirdupois); thus Y. running thirty such hanks to the lb. would be called thirty counts. Linen Ys. are of two kinds, line and tow. They are counted by the number of leas of 300 yds. in 1 lb. Woollen Y. is soft, fluffy, and elastic. In the W. of England it is counted by the number of hanks of 320 yds. in 1 lb., in some parts of Yorkshire by the number of yds. in 1 oz.; each dist. however, has its own method of counting.

Worsted Y. is smooth and strong. It is counted by the number of hanks of 560 yds. in 1 lb. Net silk may be Organzine or Tram; the former is more twisted than the latter, but both are very strong. Spun silk is made from the silk set aside in the manuf. of fabrics from the cocoons. Silk Ys. are counted by the weight of 1000 yds. in drams, or by the number of deniers in one hank, a denier being equal to  $\frac{1}{160}$  lb. Ys. are folded for greater strength. In the hope of simplifying the methods of designating Y. counts, the Textile Institute has for years attempted to secure the adoption of a single standard method. In this connection mention must be made of the method known as Grex proposed in America, and gK, proposed by the Textile Institute: these are respectively the weight in grams of 10,000 metres and the weight in grams of 1000 metres.

See British Standards 946 (1941) 'Designation of twist in single yarns, folded yarns, and cables,' and 947 (1941) 'Yarn count systems and conversions.'

**Yaroslavl**, or **Yaroslav**, tn. of the R.S.F.S.R., cap. of the Region of Y., on the Volga, 160 m. N.E. of Moscow. A univ. was estab. in 1919. It manufs. silk, tobacco, cotton, and rope. It is a dairy-farming centre. It has a large electric-power station. There are agricultural machinery works, and synthetic rubber and motor vehicles are manufactured. It is also a centre of the linen industry. Pop. 298,000.

**Yarra Yarra**, riv. of Australia, in Victoria. Large vessels can sail up it as far as Melbourne. Length 105 m.

**Yarriba**, see **YORUBA**.

**Yarrow**, riv. of Selkirk, Scotland. At the tn. of Selkirk it joins the Ettrick Water. Newark Castle is on its banks. It is known for its literary and historic associations and for its beautiful scenery, described by Wordsworth and Hogg. Length 14 m.

**Yarrow**, see **MILFOIL**.

**Yassy**, see **JANNY**.

**Yawl**, see **under SHIPS AND SHIPBUILDING**; **SAILS AND RIGGING**; **YACHT**.

**Yatton**, par. of Somersetshire, England, 12 m. W.S.W. of Bristol. There is a fine church of the fourteenth and fifteenth centuries, and the vicarage dates from the fifteenth century. Pop. (estimated) 3000.

**Yawning**, like sighing, is a deep inspiration, but Y. is accompanied by a stretching movement of the jaws and sometimes also of the limbs. Y. is not invariably

a sign of boredom; sometimes it is merely the physiological reaction to high carbon dioxide content of the blood following a long period with the body immobilised. Y. is also said to be induced by the sight of another person in the act.

**Yaws**, or *Frambesia*, tropical disease characterised by the formation of red, raspberry-like tubercles upon the face, toes, and genital organs. It is an infectious disease, and chiefly affects young Negroes, though white men may suffer from it. It is endemic in the tropical parts of Africa, in Ceylon, E. and W. Indies, and many of the Pacific Is. It is caused by a spirochaete (*S. pertenuis*) which is closely similar to, or identical with, the *S. pallida* of syphilis. The treatment is the same as for syphilis: neosalvarsan, bismuth, and penicillin.

**Yazidi**, see **YEZIDI**.

**Ybo**, see **under NEGRO-AFRICAN LANGUAGES**, *Sudanic*.

**Yeadon**, part of Airedale urb. dist., W. Riding, Yorkshire, England, with manufs. of woollens. The airport for Leeds and Bradford is situated at Y.

**Year**. Astronomers recognise various kinds of Ys. The most usually employed is the *tropical* or *equinoctial* Y. This is the time required by the sun to complete a revolution with reference to the first point of Aries. The length of the tropical Y. is 365 days 5 hrs. 48 mins. 46 sec. Owing to the precession of the equinoxes (q.v.) the sun accomplishes the circuit from spring equinox to spring equinox in about 20 min. less time than it accomplishes the circuit of the heavens with reference to some fixed star, and hence the latter Y.—known as the *sidereal* Y.—is about 20 min. longer than the tropical Y. Its actual length is 365 days 6 hrs. 9 min. 9 sec. The *anomalous* Y. is the time required by the sun to return from apogee to apogee or from perigee to perigee, or expressed in another way, it is the time required by the earth to return from aphelion to aphelion or from perihelion to perihelion. Owing to the slow rotation of the line of apsides (q.v.) the position of apogee and perigee move forward in the ecliptic by 11' 25" a year so that the sun takes longer to reach each of these points than it does to complete the circle of the heavens with reference to a fixed star. The length of the anomalous Y. is 365 days 6 hrs. 13 min. 53 sec. The *eclipse* Y. is the interval between successive returns of the sun to the moon's node, and contains 346 days 14 hrs. 52 min. 51 sec.

The measurement of time over extended periods in ancient times, or among barbarous peoples, was usually based on seasonal activity; but religious observances soon introduced more accurate methods, which depended on the more easily recognised changes in the phases of the moon. Lunar changes are, however, incommensurable with the tropical Y. and it was usual to have a lunar calendar with arrangement for interpolating days or months to keep the seasons in place. The Mohammedan reckoning is still lunar, the Y. having 12 lunar months, and contains 354 days. This gives a gain of 1

in 33 and causes the seasons continually to fall in different months. The *Metonic cycle*, introduced by Meton and Euctemon about 433 B.C., among the Gks., was reckoned from new moon to new moon, and contained 235 synodic months approximately 19 Ys. of 365½ days. This cycle still remains in the *Golden Number*, which is found by adding 1 to the date number and dividing by 19, the remainder being the required number; if 0, it is considered 19. The *Calliptic cycle* takes account of leap Ys., and consists of 4 Metonic cycles or 76 Ys. In the Y. 45 B.C. Julius Cæsar, with the help of Sosigenes, reformed the calendar, and introduced the *bissextile Y.*, or leap Y., the sixth day before the kalends of March being counted twice. The previous Y. was made 445 days long and was known as the *Y. of Confusion*. The Y. being approximately 365½ days, and only 365 being counted in the *civil Y.*, an odd day is added every four Ys. to compensate; these are *leap Ys.* This, however, overcompensates, and three leap Ys. are omitted in every four centuries in order to correct the error which arises from the excess of the addition of one day in four Ys. (i.e. 6 hrs.) to the Y. over the true length of the Y., i.e. 365 days 5 hrs. 49 min. The *Besselian fictitious Y.*, used in the reduction of star places begins at the moment when the sun's mean longitude is 280°, which always occurs some moment early in Jan.; the star catalogue takes no account of aberration or the irregular motion of the celestial pole, and the reduction is necessary to give apparent instead of mean position. The *Julian cycle* consists of 7980 Ys. of 365½ days; its starting point is Jan. 1, 4713 B.C., Jan. 1, A.D. 1 being J. E. 4714. The *Julian Ys.* are used in astronomy as harmonising different chronological systems. *Jewish Ys.* are arranged in cycles of 19, with intercalary or 'embolismic' months added from time to time to maintain approximate agreement between the Y. and the seasons; the embolismic Ys., the 3rd, 6th, 8th, 11th, 14th, 17th, and 19th have 13, the others 12 months each.

**Yeast, or Saccharomyces**, ascomycetous fungus consisting of small rounded cells which multiply by budding in certain sugar solutions containing traces of mineral salts. Enzymes (q.v.) within the plant effect alcoholic fermentation (q.v.) which proceeds best at a temp. of about 30° C. (see BREWING). When the conditions arise unfavourable to growth, the Y. cell forms within it usually four thick-walled ascospores which rest until conditions favour their germination (see FUNGI). There are many different species of Y., that used for brewing not being the same as that used in bread-making, etc. Ys. are rich in vitamins, and are used medicinally for the treatment of constipation, lassitude, etc.

**Yeats, Jack Butler**, Irish painter, son of John Butler Y., a painter, and brother of W. B. Yeats; educated privately at Sligo. His vigorous portrayals of Irish life and landscape are painted in a

colourful and highly individualistic style. His pubs. include *Sailing, Sailing Swiftly* (1933), and *The Careless Flower* (1947).

**Yeats, William Butler** (1865-1939), Irish poet and critic, b. in Dublin. His family was Protestant, and his father was a painter. Y. was educated at Godolphin School, Hammersmith, and at Erasmus Smith School, Dublin. He spent the middle years of his life in London and d. in the S. of France, but his most formative years were spent in Co. Sligo.



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W. B. YEATS

He was deeply influenced and inspired by the literary and mystic-religious heritage of his native land, but Eng. and Continental forms and ideas had much effect on his later work.

Y. studied painting, but soon realised that his strongest inclinations were literary. Only in later years, however, did his poetry afford him a comfortable livelihood. Of his earliest pubs. of verse, notable productions are *The Wanderings of Oisín* (1889), *The Wind Among the Reeds* (1899), and *In the Seven Woods* (1903). He ed. the writings of Blake (1893), and it seems that of all Eng. literary influences upon him, that of Blake was the strongest and the most enduring. He lectured in England and America, and was one of those responsible for the foundation of Dublin's Abbey Theatre, of which he became a director. There is a marked difference between Y.'s early



work, full of splendid imagery and simple, spontaneous emotion, e.g. *The Wanderings of Oisín*, and the conscious art which asserts itself in such later work as *The Wild Swans of Coole* (1917). Y. laboured in his later work to achieve technical perfection. In *The Winding Star* (1929) he went back to reminiscence of his whole life as an artist: and in his posthumous *Last Poems, and Plays* (1940) poetic richness is combined with a sombre melancholy.

The greatness of his later work is now beginning to be realised: but his earlier poems still retain a generally wider popularity. *The Isle of Innisfree* and *The Rose of the World* showed that Y. could versify the legends of his country with simplicity and fervour. He possessed the power to weave moving images out of the most commonplace suggestions from the things around him. This is notably illustrated in the *Ballad of Father Gilligan*; and *A Dream of a Blessed Spirit*. Mention may be made of the *Countess Cathleen* (1892) which is directly from the Fr. source and is one of the finest of the plays of Y. It is somewhat wanting in dramatic power but contains some of the most finished poetry he produced.

Y. was awarded the Nobel Prize for literature in 1923. Ireland acknowledged his greatness by making him a senator of the Irish Free State, and nine years after his death, his body was brought from France and interred in Drumcliffe churchyard in Co. Sligo. His lyrics place him among Ireland's greatest poets: but his genius transcended national boundaries, and critics of many nations agree that in splendour of diction and imagery and clarity of vision he was one of the most outstanding literary figures of his age. See *lives and studies* by J. H. Pollock, 1935; L. MacNeice, 1941; V. K. N. Menon, 1942; P. Ure, 1946; and R. Ellmann, 1949.

**Yedo**, see TOKYO.

**Yeisk**, see JEISK.

**Yekaterinburg**, see SVERDLOVSK.

**Yekaterinodar**, see KRASNODAR.

**Yekaterinoslav**, see DNI PROPETROVSK.

**Yelisavetgrad**, see ZINOVIEVSK.

**Yelisavetpol**, see GANTZHA.

**Yell**, the second largest is. of the Shetland group, Scotland. It consists mainly of peat moorlands, but the coastal dists. are more fertile. Y. is noted for trout and sea fishing. The main centres of pop. are at Ullsta, Westsandwick, Burraroe, Mid Yell, Gutcher, and Cullivoe.

**Yellow Atrophy**, see under LIVER.

**Yellow Bird**, name for two N. Amer. birds. *Chrysomitris tristis*, thrush bird, and *Dendroica aestiva*, yellow poll warbler.

**'Yellow Book, The'** an illustrated quarterly magazine pub. by Matthews and Lane in London in 1894-97. It was distinguished for its literary and artistic contributions by Aubrey Beardsley (who was for a time its art-editor) and Max Beer-bohm, both of whom gave free rein to their dynamic powers of caricature. Another leading contributor was Henry James.

**The Yellow Book of Slane** is a collection

of Irish MSS retrieved by Irish scholars who copied them into miscellaneous indices. They range in date from the middle ages to the sixteenth century. *The Yellow Book of Lecan*, now in Trinity College, Dublin, was written at various times by the MacFibris family. It contains a great amount of Irish romance dating from the early fifteenth century.

**Yellow Cross**, see MUSTARD GAS.

**Yellow Emperor (Huang Ti)** (c. 2700 B.C.), Chinese emperor who is credited with having made a united kingdom out of all the warring groups under chieftains that were scattered over the whole country. The inventions and discoveries of many centuries have been assigned by tradition to the single reign of the Y. E.

**Yellow Fever, Yellow Jack, or Amaryl**, endemic fever occurring in tropical and subtropical regions except where rainfall is deficient; the region round the gulf of Guinea and the Caribbean Sea, the noted areas, includes the W. Indies. Y. F. occurs also on the W. coast and the Brazilian coast of tropical S. America, and in Central America. In Africa it extends along the coastal regions from Senegal to the Congo. It has spread as an epidemic further northwards into the U.S.A., and in 1940 there was an outbreak in the Sudan. Y. F. reappeared in epidemic form in Nigeria, in 1946, for the first time for many years; but with the use of D.D.T. and intensive anti-amaryl inoculation, the disease was rapidly controlled. With the usual rise of temp., vomiting and rigor are found after an incubation period usually of from one to four days. This in slight cases is the whole course. In severe cases, jaundice and hemorrhage are prominent symptoms. Hemorrhage becomes very prominent, stools and vomit being both affected. Both skin and kidneys exhibit hemorrhage and it is also common from the gums; the urine also contains excessive albumen. The usual treatment for fevers is employed. Results of recent research indicated the preventive value of vaccines made by passage of the virus through chick embryos. One attack usually gives immunity; the Negro is not very susceptible. Finlay, in 1881, suggested that the transmission of the disease was effected by mosquitoes. The Amer. Commission of 1900 traced the disease to a virus conveyed by the mosquito *Aedes aegypti*. Bauer has shown that other species of mosquito may also transmit Y. F. Gorgas carried out thorough tests of preventive measures in 1901. These were based on the prevention of breeding by the mosquito, by keeping all water vessels mosquito-proof, and covering puddles and stagnant water with oil; drainage and sanitation were thoroughly inspected and improved with the same purposes. Within six months the disease disappeared for the first time in Havana. The similar thorough measures carried out in the Panama Canal Zone completely confirmed the efficacy of the methods. See also EPIDEMIOLOGY; TROPICAL MEDICINE.

**Yellow Hammer, or Yellow Bunting** see under BUNTING.

**Yellow Hammer State**, see ALABAMA.

**Yellowknife**, tn. in the N.W. Ters., Canada, situated in Y. Bay on the N. shore of Great Slave Lake. It is the centre of a gold-mining region. The tn. was founded in 1935 after gold discoveries were made in the vicinity. Pop. between 3000 and 3500.

**Yellow Metal**, see MUNTZ'S METAL.

**Yellow Pigments**, see under PIGMENTS.

**Yellow River, Hoang-Ho, or Hwang-Ho**, riv. of China, which rises on the Odontala plain in Tibet. After an extremely tortuous course, it crosses the prov. of Kansu, flows into Mongolia, and then turns almost at right-angles S. into Shansi. It separates Shensi from Shansi, passes through Honan, and flows into the Gulf of Pechili (Chihli). The most important tns. on its banks are Lanchow and Kaileng, and its chief tribs. are the Wei Ho coming from the W., and the Fen Ho from the W. The riv. has come to be known as 'China's sorrow' on account of its tendency to burst its banks and to change its course, thereby causing great disasters, with the loss of millions of lives. In 1938 the Chinese, in an attempt to stop the Jap. advance, breached the dyke on the S. bank. Some 2,000,000 acs. were flooded and 400,000 people perished. The Y. R. is the second longest in China, and has a length of 2600 m.

**Yellow Sea (Hoang-Hai, or Hwang-Hai)**, large gulf of the Pacific Ocean, its length being about 620 m., and its greatest width 400 m. It is divided into the gulfs of Korea, Laotung, and Pechili (Chihli), and to the E. is studded with is. Its waters are shallow, and are discoloured by the yellow mud carried down by the Yellow R.

**Yellowstone National Park, U.S.A.**, U.S. Gov. Reservation in the N.W. of Wyoming, projecting about 2 m. into Montana and Idaho. It is less a park than a series of parks formed by different valleys on the two sides of the Rockies, and is subject to great extremes of climate. The whole region is of geologically recent volcanic origin, and the geysers are still active. The scenery is famous for its brilliant colouring, and natural phenomena, which include boiling springs and petrified forests, etc. There are sev. great herds of wild animals. The first white man to attempt an exploration of the region was a trapper named Colter, who in 1807 traversed a part of this dist. His tales were disbelieved, but were confirmed thirty years later by the discoveries of Bridger. In 1870 the first official survey was made, and in 1871 Hayden's expedition revealed the glories of the Yellowstone dist. Y. N. P. became a National Park in 1872. Area, 3355 sq. m.

**Yellowstone**, riv. of the U.S.A., trib. of the Missouri. Its source is in the Wyoming Rockies. It flows N.W. through the Grand Canyon, then E. through Montana and N. Dakota to join the Missouri. Length, 1050 m.

**Yemen**, The, imamate or kingdom of S.W. Arabia, bounded on the N. by Asir and Nejran (both now belonging to Saudi Arabia), on the E. by the Hadhramaut, on the S. by the rest of the Aden pro-

tectorate, and on the W. by the Red Sea. The Imam Yahya bin Muhammad Hamid Ud Din, head of the Zaidi sect of the Shiites (1904-48), pursued a policy of isolation in international affairs and even as late as 1950 European nations sent no diplomatic representatives to the Y. In that year, however, negotiations resulted in recommendations for an exchange of diplomatic representatives between Great Britain and the Y. The Y. is ruled by Islamic law and custom of the traditional type, with little regard for the modifications now admitted by other Moslem countries. Slavery is permitted, and non-Muslims, particularly Jews, of whom few remained in 1950, are subjected to many disabilities. The land is fertile, there being an abundant and regular rainfall; and there are large exports of coffee, food-grains, hides, and raisins, and, despite the conservative instincts of the ruling dynasty, the barriers which once separated the Y. from the outside world have lately shown signs of weakening. In this connection, the discovery of oil in the Y. in 1947 may prove of great significance. Sa'na (*q.v.*) the cap., standing at an altitude of 7260 ft. is an ancl. walled city with eight gates, and some striking ancl. buildings. To the N. of Sa'na are the large Imamie tns. of Amran, Tawila, Al Khaur, Al Suda, and Sada; other tns. are Taizz (4600 ft.), Yerim (8600 ft.), Dhamar (7650 ft.), and Ibb (6275 ft.). The ports are Mocha, Hodeida, and Loheiya. The region of Al Jauf, watered by the Kharid, and the dist. of Saba to the S. of Al Jauf, acknowledge the suzerainty of the imam of the Y.

Before the First World War, the Y. was under Turkish suzerainty, but in 1918 the Imam Yahya proclaimed himself king of the independent kingdom of the Y. In 1926 the boundaries of the Y. were determined by a treaty made at Taif (June 1934) between Saudi Arabia and the Y. Y. was a party to the treaty of Arab brotherhood signed in 1936 between Saudi Arabia, Iraq, and the Y. The gradual emergence of this semi-feudal kingdom into closer contact with international affairs was manifested when the Imam Yahya consented to be represented among the Arab States at the London conference on Palestine in 1939; and his traditional devotion to Islam secured for him a prominent position in the councils of the Arab league, to which he adhered in 1945. In 1947 the Y. was admitted a member of the United Nations. The Y.'s oldest formal treaty of friendship is that concluded with Britain in 1934, in which agreement was reached on a provisional *status quo* line as the boundary between the Y. and the Aden Protectorate. Trade agreements have been concluded with Britain, America, Russia, and France. The Imam Yahya and two of his sons were assassinated in Feb. 1948. Abdulla al Wazir, a former minister of state, proclaimed himself king. In March, however, Seif al Islam Ahmed, Yahya's eldest son, rallied the tribes and estab. himself as the Imam Ahmed bin Yahya Muham-

mad Hamid Ud Din. Area 75,000 sq. m. Pop. c. 3,500,000 (estimates vary: the exodus of the Yemenite Jews to Israel, complete by the end of 1949, substantially reduced the pop.). See H. Scott, *In the High Yemen*, 1942; and A. Farouqby, *Introducing Yemen*, 1947.

**Yemr**, see **YMIR**.

**Yen** (Jap. and Chinese *quan*, round dollar), gold Jap. monetary unit, equal to 100 sen; also a silver coin of the same value, which was formerly current. In Oct. 1897, the gold standard was adopted with a unit value of 0.75 gramme of pure gold, called the Y., then equal to 2s. 0½d., or 49½ U.S. cents., the pieces coined being 20, 10, and 5 Y. gold coins. Subsequently these gold pieces were used at double their face value and the one-Y. silver was withdrawn. The notes of the Bank of Japan are of 5 denominations, 1, 5, 10, 20, and 100 Y. The pre-1939 Y. had an exchange value of 23 cents U.S. The Y. had no international exchange value in 1950, but a one-way exchange rate of £1 = 1090 Y. existed for the occupation forces.

**Yendys, Sydney**, see DOBIE, SYDNEY THOMPSON.

**Yenikale Strait**, see under **KERCH**.

**Yenisei**, or **Yenessei**, riv. of Siberia in the R.S.F.S.R., nearly 3000 m. long, which marks the natural div. between the W. Siberian lowland and the Central Siberian plateau. It rises in the plateau region of Tuva in Mongolia, and flows W. as far as the Russian S. border and then mostly due N., in a wide valley, along the E. edge of the lowland, to the Arctic Ocean. There are rapids below Krasnoyarsk, navigable with the aid of steam-tugs. The area of the basin of the Y. and its tribs. is about 1,000,000 sq. m. Above the tn. of Yeniseisk the width of the riv. varies from one to four m., according to the season. The riv. spreads out into a large estuary with sev. wide mouths. Ocean-going vessels can enter the mouth with ease. The channel at Igarka, the new Arctic port, is 4 m. wide, while at the mouth the riv. broadens to a maximum width of 20-40 m. The Y. has become the highway along which the wealth of Siberia is borne in an increasing volume.

**Yeo**: 1. Riv. of Somersetshire, rising in Dorset. It flows past Yeovil and joins the Parret after a course of 25 m. 2. Another riv. of Somersetshire. It rises near Harptree and flows by way of the Y. Reservoir into the Bristol Channel. Length 17 m. There is also a Y. in Devon.

**Yeoman**, originally a forty-shilling freeholder intermediate in status between the gentry and the peasantry; qualified to serve on juries and vote for knights of the shire, etc. Later, it meant a small landowner or person of the middle class engaged in agriculture.

**Yeomanry**, name applied to mounted volunteer corps, not generally so called until 1794. Bodies of volunteer horse were raised before this at the time of the 1745 rising. The first such unit was the Northampton Defence Association raised

in that year, a strong troop of 200-300 gentlemen and their mounted servants. In that year also certain landowners of Yorkshire formed the Royal Regiment of Hunters 'to harass the Rebels in their march.' Following on the early successes of the Fr. revolutionary armies, a second wave of yeomanry corps came into being in 1794, but was not this time intended to fulfil a guerilla rôle but to replace cavalry regiments of the line drafted overseas. By May of that year 32 corps were in being; the first was the Rutland corps with three troops, followed by Kent and Surrey with seven and six troops respectively. A troop had anything between 40 and 80 effectives. By 1798 every co. and sev. large tns. had raised Y. to a total for the whole country of 163 troops, each nominally 150 strong, though probably there were only about 16,000 effectives in all.

Regulations for the raising and maintenance of such troops were in general the same as for Volunteers, the gov. provided only ammunition except on actual service and the Y. were bound to act as mounted police in case of riot (see **VOLUNTEERS**).

After 1816 the Y. were reduced but not, like the foot volunteers, entirely disbanded and they participated in the volunteer revival of 1848-63. Between 1899 and 1918 fifteen new Y. regiments were raised, of which two, the Lovat Scouts and the Scottish Horse, served as regiments in S. Africa. The rest provided drafts for the Imperial Yeomanry.

In 1914 there were 53 regiments of Y. Some served dismounted on the W. Front, one an cavalry div. of the Egyptian Expeditionary force (the 74th) was entirely made up of Y.

When the Territorial Force was constituted in 1908 the Y. was merged in it with the Volunteers and part of the militia, and when it was revived in 1922 as the Territorial Army it included 55 Y. regiments. Six of these formed the 5th and 6th Cavalry Brigades, there were eight Army Troops Cavalry Regiments, eight groups of Armoured Car Companies, eight Field Brigades R.A., and the remainder were converted to other arms, most artillery. In these capacities they served in the Second World War, and still retain their individuality. The greater number of them are now Armoured Car Units.

**Yeomen of the Guard**, royal bodyguard, employed on state occasions as part of the sovereign's retinue. It was founded by Henry VII. in 1485. It is formed of old soldiers of fine appearance and numbers 100 men, three officers, a clerk of the cheque, and four corporals, and one of their duties at present performed is that of Wardens of the Tower of London. The uniform has undergone many changes, and does not, as is popularly supposed, closely follow the original costume of the guard. The first scarlet livery was introduced in 1514; the uniform worn to-day has not altered since the eighteenth century. The term 'Beef-eaters' is of uncertain derivation, but it seems most

likely that the name was applied in the late seventeenth century on account of the large daily ration of beef given to the guard. See Sir R. Hennell, *History of the King's Body-guard of the Yeomen of the Guard*, 1904.

**Yeovil**, municipal bor. and mrkt. tn. of Somersetshire, England, on the R. Yeo. The church of St. John the Baptist is a fine cruciform structure with a fifteenth-century tower. Y. is noted for its manuf. of gloves. Pop. (estimated) 23,600.

**Yew**, *Taxus baccata*, European evergreen tree, with linear leathery leaves and dioecious flowers, followed by bright, rose-red, cup-shaped fruits or arils. The tree attains a very great age; its wood is hard and close grained, but splits readily. It was formerly used for making long-bows. Its leaves and seeds are poisonous.

**Yezd**, tn. of Persia, in the prov. of Y. of which it is the cap., 165 m. E.S.E. of Isfahan, one of the centres of the silk industry of Persia. Y. contains eighteen mosques. Pop. 60,000.

**Yezidis**, or **Shemsih Kurds**, religious sect whose chief settlement is in the Sinjar hills, N. of the Mesopotamian plain. They are also found on the Van and Erzerum plateaus, in Persia, and in Transcaucasia, near the E. bank of Lake Gokcha. They hold beliefs derived from Mohammedan, Christian, and various other sources, and are commonly called 'Devil Worshipers.' Their religion is based on the worship of good and evil.

**Yezo**, see HOKKAIDO.

**Yggdrasil**, **Iggdrasil**, or **Igdrasil**, in Norse mythology, the vast ash-tree which was the entire universe.

Y. has three roots: one is in Nifheim, in the well Hvergelmir, which the dragon Nithlög gnaws ceaselessly; one in Jotunnheim, in the well Mimir, the source of all wisdom; and the third, in Urthabrunn, from the waters of which the Norns sprinkle Y. every day to avert its decay. The branches of Y. are inhabited by an eagle and a hawk; the foliage feeds four sacred harts; and Ratatöskr, the strife-making squirrel, goes continuously up and down the trunk in order to maintain the hostility of the eagle for Nithlög. Y. is really the Nordic equivalent to 'the tree of Life.'

**YHWH**, see under JEHOVAH.

**Yiddish** (Ger. *Judisch*, Jewish), the language of E. European Jewry and of its many emigrants in other parts of Europe and overseas (especially in the U.S.A., where there are some four to five million Y. speakers), originated in the Rhineland in the nineteenth century. Y. is based on medieval Ger. as it was spoken by Jews, who added to it many Heb. words and phrases peculiar to Jewish life and observance. Jewish immigration transplanted it to various countries (Poland, Russia, Lithuania, Rumania, etc.), also to England, U.S.A., S. Africa), where Y. absorbed other Heb. words as well as words from Polish, Russian, Eng., etc. Y. employs the modern Heb. alphabet (with slight modifications), and is written from right to left; it has a rich literature: the best

known living Y. writer is Sholem Asch.

**Yird-house**, see EARTH-HOUSE.

**Y.M.C.A.**, see YOUNG MEN'S CHRISTIAN ASSOCIATION.

**Y.W.C.A.**, see YOUNG WOMEN'S CHRISTIAN ASSOCIATION.

**Ymir**, in Norse mythology, a giant formed from the ice of the rivs, called *Elivagar* when it was melted by a warm blast from Muspelheim on the further side of Ginnunga-gap. Y. was nurtured by four streams of milk from the cow *Audhumla*, which created Buri, the grandfather of Odin. He fathered the Jötuns, a race of evil giants, but Buri's wonderful grandchildren—Odin, Vili, and Vé—slay Y. and the race of giants all, save Berglöm and his hideous wife, drowned in his blood. Y.'s body was flung into Ginnunga-gap abyss, and his slayers made from his blood the sea, from his bones the mts. and rocks, from his skull the firmament, from his brain the clouds, from his flesh the earth, and from his eyebrows Midgard where Man was eventually to dwell. Y. is known as the Rime Giant and is regarded as typifying primeval chaos.

**Ymuiden**, or **Ijmuiden**, seaport of Holland in the prov. of N. Holland, 6 m. from Haarlem. It stands at the end of the N. Sea Canal, by which it is connected with Amsterdam of which it is an outport. This canal is one of the most important waterways of Holland for transmarine traffic. There are fisheries and chemical industries. Pop. (with Velsen), 43,000.

**Yodel**, primitive, wordless song, or warble practised in various forms by mt.-dwellers in Switzerland, Tyrol, Styria, etc., characterised by rapid modulations from chest notes to falsetto, very free in rhythm and metre and using as a rule the restricted scale of the natural harmonics of instruments like the alphorn. The Y. is first mentioned in Acts of Martyrs, A.D. 397, but is doubtless prehistoric. Probable origin, the *Taucheer* or whooping cry still used in greeting or warning.

**Yoga**, fourth of the six systems of Hindu philosophy, commonly regarded as a theistic development of the Sankhya, directly acknowledging Ishvara, or a supreme being. Its alleged author is Patanjali, and its aim is to teach the means by which the human soul may attain complete union with the Supreme Soul. See S. Dasgupta, *Yoga as Philosophy and Religion*, 1921; and P. Brunton, *A Hermit in the Himalayas*, 1949.

**Yohimbine**, alkaloid (q.v.) of the chemical formula  $C_{17}H_{21}N_3O_2$ . It occurs in the leaves and bark of the yohimbine tree (*Corynanthe Yohimbe*) and is used, particularly in veterinary practice, as an aphrodisiac.

**Yokohama**, chief seaport of Japan, on Tokyo Bay in the Is. of Honshu, with a good and commodious harbour. Y. in 1859 took the place of Kanagawa, which was first appointed as the treaty port on the W. side of Tokyo Bay, and now includes it. The tn. grew rapidly and had considerable trade. With Tokyo,

it was largely destroyed in a great earthquake, 1923, but was afterwards reconstructed. The chief imports are cottons, woollens, metals, sugar, and petroleum; the chief exports silk, tea, copper, and coal. Y. was heavily raided by Amor. bombers in 1945, and suffered severe damage. Pop. 968,100. See PACIFIC CAMPAIGNS IN THE SECOND WORLD WAR.

**Yola**, tn. and prov. in N. Nigeria, Africa. The latter has an area of 11,600 sq. m. and an est. pop. of 300,500. The chief crops are cotton, rice, and tobacco. The tlf. on the R. Benue is the cap. of the prov.

**Yolo Archipelago**, see SULU.

**Yôm Kippur**, or **Yôm Ha-Kippurim**, known also as Day of Atonement or Feast of Expiation, is the most important and solemn of all the Jewish festivities. It is celebrated on the 10th of the seventh month, i.e. Tishri (which is the first month of the 'civil' year: see RÔSH HA-SHANAH), or five days before the Feast of Tabernacles. It is observed as a day of rigid rest from work, and given up to fasting, humiliation, affliction of soul, and prayer: the sins of the year are brought into special remembrance. On this day also the ram's horn (*shofar*) is sounded. Jewish atonement is quite different from the vicarious atonement (*q.v.*), which Jesus brought to mankind. The belief of the Jew was, and is, that every man shall die for his own sin, that no intermediary between himself and God is required. The manner of celebrating Y. K. in anct. Israel is set forth in *Leviticus* xvi.

**Yonge, Charlotte Mary** (1823-1901). Eng. novelist, b. at Otterbourne, Hants. She pub. various historical works, a *History of Christian Names* (1863), and a monograph on *Hannah More*; but she is chiefly remembered as the author of the sentimental novel *The Heir of Redclyffe*, which she pub. in 1853, and *The Daisy Chain* (1856). See lives by C. Coleridge, 1903; S. Bailey, 1934; and G. Battiscombe, 1943. See also Margaret Mare and Alicia Percival, *Victorian Best-Seller*, 1948.

**Yonkers**, city of Westchester co., New York, U.S.A., on the Hudson R., N. of and adjoining New York City, of which it is a residential suburb. It produces carpets and rugs, foundry and machine-shop products, etc. Pop. 142,600.

**Yonne**, dept. of central France, with an area of 2892 sq. m. It belongs to the basins of the Seine and the Loire, chiefly the former, and has a temperate climate, except in Morvan, where the extremes of heat and cold are greater, and where the rainfall is most abundant. Wheat and oats are the chief cereals, and the vine covers about 6 per cent of the surface. There are three arrons.: Auxerre (the cap.), Avallon, and Sens. Pop. 266,000.

**York**, city and mun. bor., cap. of Yorkshire, England, seat of an archbishopric, on the R. Ouse, 175 m. N.N.W. of London. It is one of the most famous of Eng. cities and contains many varied historical remains. Sev. light industries have been estab. in Y. since 1900. Manufs. include cocoa, chocolate, and confectionary, sugar-beet, glass, furniture, and

scientific instruments. Railway coaches and rolling stock are made, and there are printing works. It is a military centre.

Excavations have revealed a consecutive hist. of the Rom. occupation, when Y. was called Eboracum, and it was the cap. of the Brit. prov. Rom. remains include a fragment of the earthen defence of the earliest Rom. fortress (A.D. 71), and the Multangular Tower, built c. A.D. 300 by the emperor Constantius. In Saxon times Y. was a royal city and a leading centre of missionary work and education: its school (St. Peter's), was known throughout Europe. In the first church on the site of the present Y. Minster, Edwin of Northumbria was baptised by Paulinus (627). Y. was a flourishing trading centre under the Danes. Domesday Book statistics suggest that the pop. in the early eleventh century was about 9000, second in size only to London. The Plantagenet wall around the old city has a circumference of 2½ m., pierced by four great Bars, or Gates—Bootham, Monk, Walmgate, and Micklegate. The walls are now a promenade. Clifford's Tower (c. 1259) stands on the original Norman mound.

Y. Minster, or 'the cathedral and metropolitical church of St. Peter' is one of the most famous of Europe's Gothic buildings. Two churches were built on the site in the seventh century, and are mentioned by Bede. The first was a tiny wooden church dedicated to St. Peter, and erected for the baptism of Edwin in 627. The second was of stone and was finished in 642. Bishop Albert built a new basilica on the site of one of these churches in the eighth century. When Wm. I. besieged Y. the existing church was severely damaged and Y.'s splendid library was completely destroyed.

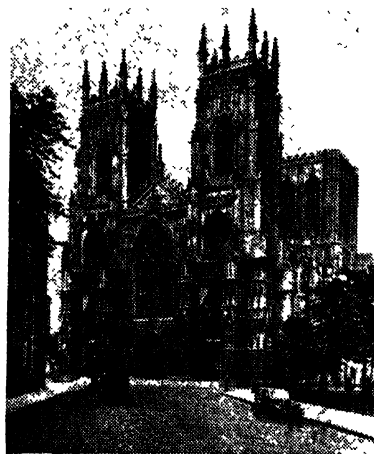
Some of the Saxon walls remain in the present crypt. In 1070 the first Norman archbishop of York, Thomas of Bayeux, restored the Minster, and built the Norman nave and transepts, probably using part of Bishop Albert's church as the choir. The choir and crypt were rebuilt in the twelfth century by Archbishop Roger. The present transepts were erected between 1220 and 1260, and the Norman nave was taken down and a new one built in the first half of the fourteenth century and the chapter house was built. The fine W. window was glazed in 1338. John Thoresby undertook the building of a new choir in 1361, for the enormous transept and nave, the largest in the country, had dwarfed Roger's structure. In the same year he laid the foundation of a great extension of the minster to the E. A Lady Chapel was added. These changes made the early Eng. tower of de Gray unsuitable, and in 1400-1423 a central tower was built in its place. The N. and S.W. towers were added between 1433 and 1471. This completed the Minster, and in 1472, after many reconstructions and enlargements, its appearance was almost the same as at the present day, although fires in the nineteenth century necessitated considerable repairs. Outstanding features of Y.

Minster include its W. front, its nave, its crypt, its stained-glass, and a number of individual monuments. Many critics consider the Gothic W. front to be the best cathedral façade in Eng. The nave is remarkable for its size and graceful piers. The crypt was mainly discovered after the fire of 1829. It contains part of archbishop Roger's cathedral and some 'herring-bone' work. Among Eng. churches Y. Minster is pre-eminent in the amount, range, and quality of its surviving medieval glass of all periods from c. 1180 to c. 1510. A panel of this glass occupies the foot of the middle light of the Five Sisters Window in the

defacement during the Reformation, and the numerous medieval brasses were reduced to one. Interesting monuments include the tomb of Richard Scrope, archbishop from 1398 to 1405, who was executed outside the city walls, and the tomb of Archbishop Walter de Gray (1215-55). There are sev. curious gargoyles, and the choir-screen (c. 1475-1500) is a fine piece of Perpendicular work. The Minster library contains a most varied and anct. collection of written and printed records. The archbishop's house is at Bishopsthorpe. The archbishop's palace, to the N. of the Minster, was demolished at the end of the sixteenth century.

There are 15 other medieval churches in Y., many of them containing much fine old stained glass. All Saints, N. Street, contains Early Eng., Decorated, and Perpendicular styles. Its anct. glass is among the finest in England. St. Denis, Walmgate, on the site of an older Norman church, was the fishmonger's church. In St. Michael-le-Belfrey, built in 1535 on the site of an older church, Guy Fawkes was baptised in 1570. Four medieval guildhalls survive, but the finest of these, the city guildhall (1447-53), was almost totally destroyed in an air-raid in 1942. The others are those of the Merchant Adventurers, the Merchant Taylors, and the Guild of St. Anthony. In the Museum Gardens are the remains of the Benedictine Abbey of St. Mary (1280-1300). The King's Manor in Exhibition Square, originally the abbot's house, was later the headquarters of the King's Council of the N. There are extensive remains of St. Leonard's Hospital, 1260-80, the largest hospital in medieval England. Sev. of the old streets in the centre of Y. still retain a medieval aspect, being narrow and crooked, with gabled overhanging houses. Of these, the most famous is The Shambles, which has been a butchers' street for a thousand years. Restoration of The Shambles began in 1944. Other interesting buildings of medieval origin are the Treasurer's House and St. William's College; the latter is now used for meetings of Convocation.

Y. contained a strong body of Catholic resistance at the Reformation, and sev. Reformation Catholic martyrs, including Margaret Clitherow, were natives of Y. Y. was Royalist at the beginning of the Civil War, but capitulated to Parliament after Marston Moor. At the industrial Revolution, its commercial importance declined, but it has revived to some extent since the beginning of the twentieth century. In the Yorkshire Museum is one of the finest collections of Rom. relics in Britain. Other museums include the very fine Castle Museum (opened 1938). St. Peter's School, Y., claims to be the oldest public school in England. A royal school of St. Peter existed as early as 627. St. Wilfrid and Alcuin taught there. The school was further endowed by Philip and Mary in the sixteenth century. It removed to its present site in 1844. It is administered by a board of governors who include representatives of the arch-



*Valentine & Sons Ltd., Dundee*

**YORK MINSTER: THE WEST FRONT**  
A fine example of English Gothic.

N. transept. It represents the story of Habakkuk lowered into the lions' den by an angel to succour Daniel. Another panel of the same date is one which formed part of a Jesse tree.

The Five Sisters window was partly restored between 1923 and 1925 as the Empire's memorial to the sacrifices made by women and girls in the First World War. On the S. wall of the N. transept is a fine rose-window, in the gable, inserted to mark the 'union of the roses' of York and Lancaster by the marriage of Henry VII. and Elizabeth of York. But the chief glory of the whole collection of medieval glass at York, even including that in sev. par. churches, is the great E. window (1408). It is the work of John Thornton of Coventry. The window is 80 ft. by 30 ft. and each of its 117 panels measure almost 3 ft. square and the various panels represent scenes from the O.T. and the Apocalypse. Many of the tombs in the Minster suffered wholesale

bishop of Y., and the dean and chapter of the Minster. There are nearly 450 pupils, in the main school, and there is also a preparatory dept. There are entrance scholarships, and leaving scholarships tenable at the univ. Bootham School, Y., was estab. in 1823, and in 1829 was taken over by the Society of Friends. It is administered by a board of governors. There are about 300 pupils. Other famous schools in Y. are The Mount School, and Archbishop Holgate's Grammar School, a sixteenth-century foundation. The city has had a lord mayor since 1389. Y. returns one member to Parliament, where it has had bor. representation since 1295. Pop. 104,000. See F. Harrison, *Guide to York Minster* (on sale in the Minster), 1926-1950; G. Home, *York Minster*, 1936; 1947; M. Spence and M. E. Everett, *A Short History of York*, 1949.

**York:** 1. City and co. seat of Y. co., Penn.-sylvania, U.S.A., on the Condorus Creek, 28 m. from Harrisburg. It originated as a Quaker settlement, and has an eighteenth century Quaker meeting-house. It has numerous manufs., and is the trade centre for a rich agric. region. Pop. 56,700. 2. Mun. tn. of W. Australia, 77 m. E. of Perth. It is in a dist. which is the prin. source of the sandal-wood supply. Pop. 4000.

**York, Frederick Augustus, Duke of** (1763-1827), Brit. soldier, second son of George III., b. in London. He was given the bishopric of Osnabrück at the age of six months, so that he might receive its vast revenues. In 1784 he was created duke of York and Albany. In 1798 he was made commander-in-chief, despite his ignominious failure against the Fr. in 1793; he also failed in 1799; but his army reforms seem to have been soundly conceived. He is commemorated by a column, with his statue on the top, near the Mall. He is also commemorated in the anonymous lines:

'The noble Duke of York,

He had ten thousand men,

He marched them up to the top of the hill

And he marched them down again,' etc. See A. Burne, *The Noble Duke of York*, 1949.

**York, House of**, branch of the Eng. royal dynasty of Plantagenet, descended from Lionel, duke of Clarence, third son of Edward III., and Edmund, duke of York, fifth son of Edward III. The head of the house was Richard, duke of York, who was killed at the Battle of Wakefield, 1460. His sons, Edward IV. and Richard III., and grandson, Edward V., were kings of England, 1461-85. Henry VII. united the houses of York and Lancaster by marrying the daughter of Edward IV., Elizabeth. The title, duke of York, has in recent times been borne by the second son of the reigning monarch.

**York and Lancaster Regiment**, Brit. regiment, formerly 65th and 84th Foot Regiments. The 65th was raised in 1756 as the 2nd Battalion, the 12th Foot (Suffolk Regiment), was made a separate corps in 1758, and went to the W. Indies, and from there to America for the War of

Independence. Later it again went to the W. Indies and participated in the capture of Martinique and Guadeloupe, thence to the Cape and India, where it fought with distinction in sev. wars. The 84th was raised in 1793: its early service was at the Cape and in India and later in the Peninsula. It served with distinction during the Indian Mutiny and at Tel-el-Kebir. Both regiments were linked in 1881. During the First World War the Y. and L. raised twenty-two battalions and served in France, Flanders, Italy, Macedonia, Gallipoli, and Egypt. In the Second World War the regiment fought in France, Norway, Italy, and Germany. The 2nd Battalion took part in the defence of Crete and the garrisoning of Tobruk, and later formed two columns of Gen. Wingate's Chudits in Burma.

**York Cycle**, see under MIRACLE PLAY.

**Yorke, Philip**, see HAWDWICKE, PHILIP YORKE, first EARL OF.

**Yorkshire**, N.E. maritime co. of England; bounded on the N. by Durham, S. by the shires of Lincoln, Nottingham, and Derby, E. by the N. Sea, and W. by Lancashire and Westmorland. It is the largest co. in England, and is divided into three Ridings, N., E., and W., each forming a separate administrative co. The coastline is fairly even, with cliffs of an average height; the largest indentation is that formed by the mouth of the Humber, which separates Y. from Lincolnshire, others being Bridlington, Filey, and Robin Hood bays, and the mouth of the Tees which separates it from Durham. At Boulby the cliffs reach a great height (666 ft.), and again at Flamborough Head; from this point to Spurn Head, a narrow flat isthmus at the mouth of the Humber, the coast is low. The surface of the co. is varied, on the W. crossing by the Pennine Range which reaches a height of 2591 ft., at Mickie Fell in the extreme N., cut by beautiful dales, the prin. being Teesdale, Wensleydale, and Wharfedale; while the centre is a vast plain, the plain of York including the vale of Mowbray. In the N.E. are the Cleveland and Hambleton Hills with small valleys such as Bilsdale and Farndale running down to the vale of Pickering which separates them from the Wolds in the E. Riding. The prin. rivs. are the Ouse, which with the Trent forms the estuary of the Humber, and is itself formed by the junction of the Swale and the Ure) and its tribs. the Wharfe, Aire, Nidd, and Don, with the Derwent on the E. In the N. are the Esk and the Tees flowing into the N. Sea, and in the W. the Ribble.

Of the attractive holiday resorts on the coast, the best-known are Scarborough, Whitby, Bridlington, Filey, Saltburn, and Redcar. Harrogate, twenty-two m. W. of York is an important inland spa specialising in rheumatic treatments. The E. Riding is the great corn-growing dist. with Driffield as the agric. centre. Oats and barley are the chief crops; and sheep are an important part of the husbandry. Sheep-farming extends over the fells of the N. and W. Ridings, and dairy-farming

in the valleys; whilst large poultry-farms are estab. near Keighley. Forced rhubarb is grown widely around Leeds, and liquorice is made at Pontefract. Cleveland Bays and race-horses are bred in the N. Riding. Yorkshire possesses valuable coalfields in the southern half of the W. Riding. In the N. Riding, industry is centred at Middlesbrough; and Teesside is the greatest steel-producing centre in Great Britain. The great woollen manufacturing centres are in the W. Riding at Leeds, Bradford, Halifax, Huddersfield, the Colne valley, etc., where woollens, worsted, flannels, fancy tweeds, etc., are made. Wholesale clothing and leather are manuf. at Leeds. Sheffield has developed, from small forges situated in the surrounding countryside, into the centre of a vast iron and steel trade specially noted for plate and cutlery. Important fisheries exist at Hull, which has the largest fleets of up-to-date fishing craft in the world; at Scarborough, and at Whitby. Trawlers are built at Selby and cobles at Whitby; and Selby and Hull have large seed-crushing and flour milling concerns. Communications are excellent: besides arterial roads and railways there is a system of canals which connects with the sea the prin. ports being Hull and Goole; and in the N. Middlesbrough. The co. returns in all fifty-eight members to Parliament. York is the co. tn.

Y. formed part of the Brigantian kingdom of Deira with the Parisii in Holderness. It was conquered by the Romans in the 1st century A.D., and by the Danes in 875, and came under the rule of Harold of England in 1066 after the Battle of Stamford Bridge. It was devastated by the Normans. Since then the co. has been the scene of many battles. In the wars of the Roses the duke of York was slain at Wakefield in 1460, and the following year the Yorkists defeated the House of Lancaster on Towton Field. During the Civil war the co. was divided, and the prin. battle was fought at Marston Moor where the Royalists were defeated. More than two hundred and sixty ant. monuments, prehistoric, Rom., and medieval, are protected. The co. has been noted for its archaeological interest for sev. centuries, and there is a wealth of archaeological literature. Among many castles, the best known are Richmond, Bolton, Skipton, Knaresborough, and Scarborough. Middleham Castle was a residence of Warwick 'The King Maker'; and Richard II. was murdered at Pontefract Castle in 1399. Of the eccles. remains the most important are the Cistercian abbeys of Fountains, Rievaulx, Jervaulx, Kirkstall, and Roche; the Augustinian priories of Bolton and Kirkham; and the Premonstratensian House at Easby. At York is the Benedictine abbey of St. Mary. There were Benedictines at Whitby. Of York, Beverley, and Ripon Minsters, York is the finest.

In pop. Y. represents about one-tenth of the total pop. of England and Wales. The area is 3,888,237 ac. (E. Riding, 750,115 ac.; N. Riding, 1,362,058 ac.; W. Riding, 1,776,064 ac.); and the pop.

(1945), E. Riding, 429,200; N. Riding, 443,000; W. Riding, 3,254,500; the estimated total pop. being 4,126,700.

See *Victoria County History, Yorkshire*; T. M. Fallow (ed.) *Memorials of Old Yorkshire*, 1909; A. C. Price, *The County of the White Rose*, 1915; P. F. Kendall and H. E. Woot, *The Geology of Yorkshire*, 1924; F. Elgee, *The Archaeology of Yorkshire*, 1932; F. R. Pearson, *Roman Yorkshire*, 1936; A. J. Brown, *Striding Through Yorkshire*, 1938; Ella Pontefract and Mario Hartley, *Yorkshire Tour*, 1939.

**Yorkshire Coach Horse**, see under *Horse*.

**Yorkshire Light Infantry (King's Own)**, Brit. regiment. The famous 'Koylis' were formerly the 51st and 105th Regiments. The 51st was first raised in 1755 as the 53rd, becoming the 51st in 1757, and gained early distinction at Minden. Sir John Moore, of Corunna fame, commanded in 1791, and the regiment took part in the retreat and sev. of Wellington's great battles in the Peninsula and at Waterloo. Further service was seen in the Burma war and later in the Second Afghan war of 1878-80. The 105th was raised in 1839 in India as the 2nd Madras European Light Infantry and served in Madras and Burma. After the Indian Mutiny it was transferred to the Brit. line as the 105th. The regiments were linked in 1881. Its present name was not finally adopted until 1921. During the First World War it raised twenty six battalions and served in France, Flanders, Italy, Macedonia, and Egypt. In the Second World War the regiment fought on the W. Front, in Italy, and in Burma. In the battle of Normandy a battalion was in the fierce battles for Tilly-sur-Seuilles and took a prominent part in the attack on Tessel Wood near Fontenay-le-Pesnil.

'**Yorkshire Post, The**', the chief Conservative paper in the Eng. provinces. It has an international reputation and is widely quoted abroad. It began its life as *The Leeds Intelligencer*, a weekly started by Griffith Wright in 1754. The paper remained in its founder's family nearly 65 years, but from 1818 it passed through the hands of various proprietors. It was appearing three times a week in 1866 when it was bought by a group of Conservatives, with Mr. Wm. Beckett-Denison, a Leeds banker, as the first Chairman. It was then made a daily and re-named *The Yorkshire Post and Leeds Intelligencer*. The first chairman died in 1890 and was succeeded by his nephew, Mr. E. D. Beckett Faber (later Lord Faber), and he in turn was succeeded in 1920 by his first cousin, the Hon. Rupert E. Beckett, who remained chairman until 1950. In 1939 the *Leeds Mercury*, founded in 1718, was merged with *The Yorkshire Post*. Among distinguished editors of *The Yorkshire Post* have been Charles Pebody (appointed 1881), H. J. Palmer (1890), J. S. R. Phillips (1903), and Arthur Mann (1919). Since 1939 W. L. Andrews has been the editor. In 1890 the company started *The Yorkshire Evening Post*, now the leading



evening paper in Yorkshire and printed simultaneously in Leeds and Doncaster.

**Yorkshire Regiment (The Green Howards, Alexandra, Princess of Wales's Own Yorkshire Regiment)**, Brit. regiment, formerly the 19th Foot, raised in 1688. It served under Marlborough at Malplaquet. From 1738 to 1748 the Hon. Charles Howard was its colonel, and its facings were green. From these peculiarities, the name 'Green Howards' arose, to distinguish it from other regiments with Howards as colonels. Further service was in Flanders, Belle Isle, America, India, Ceylon, W. Indies, N. America, and in the Crimea. Honours were also gained in Tirah and in the S. African campaigns. During the First World War it raised twenty-four battalions and served in France, Flanders, Italy, Gallipoli, Egypt, and N. Russia. The regiment served in the Third Afghan War, 1919. In the Second World War, the regiment fought in France in 1939 and in Norway in 1940, and ended its war service in 1945 on the Baltic coast of Germany. Four battalions served in N. Africa, at Azala, Alamain, and in particular, at the Marsh Line which they broke by frontal assault. These battalions were also at the Sicily and Anzio beach landings. Three V.C.'s were awarded.

**Yorkshire Regiment, The East (The Duke of York's Own)**, Brit. regiment, formerly the 15th Foot, another famous old corps, raised in 1685. It gained great distinction under Marlborough at Blenheim, etc., and under Wolfe at Louisbourg and Quebec. The regiment saw much service in W. Indies and participated in the capture of Martinique, Huvannah, St. Lucia, and Guadeloupe. On the other side of the world it went through the Second Afghan War with Lord Roberts. The title East Yorkshire Regiment, added in 1782, was amended to The East Yorkshire Regiment in 1881. During the First World War it raised twenty-one battalions and served in France, Flanders, Macedonia, Gallipoli, and Egypt. The regiment saw much service in the Second World War in Norway and at the Battle of Normandy and the subsequent advance to the Rhine. Other units fought in Burma.

**Yorkshire Regiment, The West (The Prince of Wales's Own)**, Brit. regiment, formerly the 14th Foot, raised in 1685. This famous old corps served under Wm. III. at Namur (1695) and later at Gibraltar. From 1766 to 1778 it served in the W. Indies and America. It distinguished itself at Famars, 1793, with which its regimental march 'Ca Ira' is associated, and the next year at Tournai. The regiment took part in Moore's retreat on Corunna, at Wellington's victory at Waterloo, at the capture of Bhurtpore, 1825, and in the Crimean, Afghan, and S. African wars. It gained its present title in 1881. During the First World War it raised thirty-one battalions and served in France, Flanders, Italy, Gallipoli, and Egypt. In the Second World War some units of the regiment served on the W. front, others in N. Africa and Burma.

**Yorkshire Terrier**, small, long-coated dog, classified by the Kennel Club as a toy, with straight, silky hair reaching to the ground from the back of the head to the tail and parted in the middle of the back. It is blue-grey, with tan on the head, ears, and legs. The ears are small, V-shaped, and carried semi-erect; the body is compact and level on top of the back. The weight is about 5 lb. It is a very intelligent dog, probably the result of cross-breeding between the wire-haired black-and-tan terrier (a 'toy' dog) and the Skye terrier. It needs daily grooming, the coat being brushed straight down each side.

**Yorktown**, tn. and co. seat of York co., Virginia, U.S.A., on the York R. Here the last important battle of the Revolutionary War was fought in 1781, when Lord Cornwallis surrendered to Washington. Pop. 480.

**Yoruba**, fertile and densely populated region of W. equatorial Africa, included in the Brit. colony of S. Nigeria. The Y. is one of the 4 main linguistic groups of Nigeria and, according to the last census (1931) the group numbered 3,166,154. The Y. region, with an area of about 18,500 sq. m., lies S.W. of the Lower Niger (Quorra) adjoining Dahomey on the W. and Nupe on the N.E., and reaching from Borgu nearly to the Bight of Benin. Y. is spoken with some uniformity throughout the present and ancient kingdoms of the S.W. of Nigeria and, with the spread of literacy, is developing a literature of its own. Tribal tradition holds that the Ys. originated in the Ife, where God first created man, and, although the extent of the Ife under the direct control of the Oni of Ife was much curtailed in the nineteenth century Y. civil wars, Ife is still recognised as the spiritual headquarters of the race, and the Oni enjoys a position of influence as the custodian of the tribal relics. The true origin of the Ys. is unknown to anthropologists. Up to the beginning of the nineteenth century the Y. kingdom occupied a large area, but this then crumbled before the Fulani (Mohammedan) invaders, who estab. a Fulani emirate in what had been one of the most prosperous of the Y. provs. Central Y. authority collapsed and the Y. clans entered on a period of civil war which lasted intermittently for 70 years. In the development of native administration in Nigeria following the amalgamation of N. and S. Nigeria the Brit. gov. found that the Y. area contained strong chieftainships to which the system of native administration already introduced into the emirates of N. Nigeria was readily applicable. The growing sentiment in favour of the use of traditional authorities is based on the success attained in their usage in the Y. provs. as well as in N. Nigeria.

Agriculture and cattle-rearing are carried on and there are many handicrafts in the tns., notably textile weaving. The chief tns. are: Ibadan, Oyo (the cap.), Abeokuta, and Ogbomosho. Organisation is increasing with the growing

social amenities. See Lord Hailey, *African Survey*, 1938.

**Yosemite Park**, Central California, U.S.A., national park embracing the Yosemite Valley, U.S.A., and covering an area of 1600 sq. m. The region is composed of granite, and the riv. valley is extremely beautiful, with all kinds of flowering plants and tall trees for the 6 m. of its length. The Nevada Falls are among the finest in the world. Discovered in 1851 by Bolling and his soldiers, it was made a national park by Act of Congress in 1864. It is still inhabited by a few Indians. The Yosemite Falls have a descent of 2660 ft.

**Youghal**, mun. bor., mrkt. tn., and seaside resort of Cork co., Munster, Ireland, on the W. side of the Blackwater estuary, about 27 m. E. of Cork, of which it is a sub-port. It contains St. Mary's church (eleventh century), a college founded in 1464, Raleigh's house, and other interesting buildings. There are salmon-fisheries and exports of corn and live stock. Bricks, earthenware, fine point-lace, silk, artificial silk, brocades, and carpets are made. Pop. 5500.

**Young, Brigham** (1801-77), Amer. Mormon leader, b. at Whittingham, Vermont. He joined the sect in 1832, soon became important, and succeeded J. Smith as prophet and president (1844). Under his leadership the Mormons, when driven from Nauvoo, finally settled in Utah, founding Salt Lake City (1847). Y. proclaimed the doctrine of polygamy (1852). It was Y.'s capability as an organiser and administrator that enabled the Mormon state to survive its early difficulties and become a flourishing area.

**Young, Edward** (c. 1683-1765), Eng. poet, b. probably at Upham, Hampshire. He was educated at Winchester College and Corpus Christi College, Oxford. Y. entered holy orders (1727) and became rector of Welwyn, Hertfordshire (1730). His most famous poem, *The Complaint, or Night Thoughts* (1742-46), was inspired by the death of his wife. This contains some very beautiful passages, but is chiefly notable because in it Y. deserted the classic couplet for blank verse. The work abounds in hyperbole and antitheses, but was once much admired. He wrote other poetry and sev. tragedies, but this work is generally not outstanding. See H. C. Shelley, *The Life and Letters of Edward Young*, 1914.

**Young, Francis Brett** (b. 1884), Eng. novelist, b. at Halesowen, Worcestershire, and educated at Epsom College and Birmingham Univ., where he took a medical degree. During the First World War he served as an officer of the R.A.M.C. in E. Africa. This supplies the background of *Marching on Tanga* (1918). He had earlier written a critical study of Robert Bridges (1913). His novels include: *Portrait of Clare* (1927, awarded the James Tait Black Memorial Prize); *My Brother Jonathan* (1928); *The House Under the Water* (1932); *They Seek a Country* (1937, story on the hist. of the Boers); *The City of Gold* (1939, the story of the rise of

Johannesburg); and, *A Man about the House* (1942). He has also pub. sev. vols. of poems, and *The Island* (1944), an epic of Eng. hist. In sev. of his novels Y. portrays with extreme realism the life of his native Worcestershire.

**Young, Thomas** (1773-1829), Eng. physician, physiologist, and Egyptologist, b. at Milverton, Somersetshire. He studied in London, Edinburgh, and Göttingen. Y. devoted himself to the study of natural philosophy, and wrote papers on sound and optics. Y. also did much work in the interpretation of Egyptian hieroglyphics, and was the first to translate the inscription on the Rosetta Stone: See life by F. Oldham, 1933.

**Young England**, section of the Eng. Conservative party which about 1842 began a movement whose spirit and aim are well shown in Disraeli's *Coningsby*. The author of this novel and Lord John Manners, duke of Rutland, were the chief leaders of the movement, which aimed at better relations between different social classes, in order to prevent the capture of the working-class by the Radicals.

**Young Farmers' Clubs, National Federation of**, rural youth movement that began with the formation of a few isolated Young Farmers' Clubs shortly after the First World War and in 1950 had a membership of approx. 60,000, with some 1300 clubs, together with co. federations in nearly all cos. of England and Wales. The aims of the movement are (a) to provide a country youth service which will bring together the young people of the countryside; (b) to stimulate amongst young people a greater sense of the importance of country life, and of the interdependence of agriculture and industry; (c) to encourage amongst the future generation of country folk the continuance of education where schooling finishes.

**Younghusband, Sir Francis Edward** (1863-1942), Eng. soldier and administrator, b. at Murree, Punjab, and educated at Clifton and Sandhurst. He joined the 1st Dragoon Guards in 1882. He transferred to the Indian Political Department in 1890. Y. won early fame as an explorer and traveller, and was later known as a writer on India and on Indian religion and philosophy, and for his work in connection with the organisation of conferences on world religions. He explored Manchuria in 1886, and travelled from Peking via Chinese Turkestan to India in 1887. He and Bell were the first Englishmen to reach India from China overland, crossing the Himalayas by the Mustagh Pass. Y. was political agent at Chitral, 1893-94, and was special correspondent of the *Times* on the Chitral expedition in 1895. Y. was Brit. Commissioner to Tibet, 1903-04, and Resident in Kashmir, 1906-09. He was knighted in 1904. He was President of the Royal Geographical Society in 1919. His *South Africa To-day* (1898), was the outcome of his special mission to the Transvaal and Rhodesia, 1896-97, for the *Times*. His celebrated mission to Tibet in 1903-04 led to the unveiling of the forbidden city of Lhasa. His *Memoirs, In India and Tibet*, were

written in 1910. He was chairman of the Mount Everest Committee.

**Young Ireland**, Irish political party which arose during the eighteen-forties when the agitation for Irish independence became intense. Its aim was to unite the Catholics and Protestants of Ireland in an attempt to sever the union with England.

**Young Men's Christian Association** (Y.M.C.A.), seeks to help boys and young men to accept the Christian faith and live the Christian life, and to transcend the barriers of class, politics, race and creed by a variety of religious, educational, physical, and social activities designed to develop Christian character. This interdenominational and now world wide movement was founded in England in June 1844 by (Sir) George Williams (b. 1821), then a clerk in a London drapery estab. The associations spread rapidly, especially after the Great Exhibition of 1851 and the estab. of the World's Alliance of Y.M.C.A.s in 1855. The founder died in 1905 and was buried in St. Paul's Cathedral where his bust is to be seen in the crypt; the Y.M.C.A. was further honoured by a memorial window in Westminster Abbey. The movement in 1950 had a world membership of over 3,500,000 in nearly 10,000 associations in 76 countries. During the two World Wars the Brit. Y.M.C.A.'s continued their civilian activities and also worked extensively with Brit. and Allied forces at home and in every theatre of warfare, offering personal services as well as varied programmes of religious, educational, and social activities. The World's Alliance served some millions of prisoners of war and refugees of all belligerent nations: in 1950 it was continuing this work among displaced persons in Europe and the Middle E. In 1950 the associations in England, Wales, N. Ireland, and Eire totalled 393 with a membership of over 76,000 boys and young men and nearly 8000 girls and young women, in addition to a National Women's Auxiliary numbering some thousands. The Scottish associations, forming a separate national movement, had 15,000 members in 90 centres. The largest national Y.M.C.A. movement is in the U.S.A. where there are 1582 centres and 2,625,000 members.

**Young Plan**, plan for payment of Ger. reparations after the First World War, which superseded the Dawes Plan (q.v.). It was drawn up in 1929 by an international committee of experts, chief among whom was Owen D. Young of the U.S.A.

It differed from the Dawes Plan in indicating a definite number of fixed annuities instead of payments depending on prosperity, and, instead of providing any measure of external control, it gave financial autonomy to Germany. The Plan, however, proved unworkable and payments were suspended in 1931. See also under REPARATIONS.

**'Young Pretender, The,'** see STUART. CHARLES EDWARD LOUIS PHILIP CASIMIR.

**Young's Modulus**, see under ELASTICITY.

**Youngstown**, co. seat of Mahoning co., Ohio, U.S.A., on Mahoning R., 65 m. S.E. of Cleveland. It has coal, iron, and lumber industries, foundries, blast-furnaces, and machine shops. Pop. 167,700.

**Young Turk Party**, see under TURKEY.

**Young Women's Christian Association** (Y.W.C.A.) of Great Britain, voluntary association founded in 1855 to promote the social, physical, intellectual and spiritual welfare of women and girls. International contacts and the formation of National Associations in other countries led to the institution of the World's Y.W.C.A. in 1894. Today the World's Y.W.C.A., which has consultative status on the U.N. Economic and Social Council, links together over a million and a half members, as well as five million more who share in their activities in sixty-five countries. In Britain there are over 400 centres with a membership of 40,000. Clubs are open to any girl whatever her occupation, race, or religion and most clubs have activities for boys also. Hostels accommodate girls in professions, business, and industry, and students. There is a training college for those taking up Y.W.C.A. work as a career, and courses for voluntary workers. Between 1939-45 the Y.W.C.A. opened over 800 Centres for service women in Britain and overseas. Through its International Service Committee, the Y.W.C.A. offers friendship to visitors from overseas, arranges for leaders of other National Associations to train in this country, encourages the interest of members in world affairs, and supports, with personnel and finance, associations in such countries as for instance, Nigeria, Iraq, and China. Each member pays her contribution towards the association. Hostels, once established, aim to be self-supporting, clubs depend upon members' fees and local support, and for the balance the movement depends on public subscriptions and donations and on grants from public and private bodies. In other countries the Y.W.C.A. has developed its own pattern according to the needs of women and girls of each country. For example, Britain and U.S.A. have developed their clubs and hostel work; in France programmes are based on Bible Study; in China relief work and schools for orphan children are important activities; in Nigeria there is a domestic training centre; and India organised the first training school for social studies; but in whatever part of the world, a woman or girl who joins her local centre becomes a member of a world-wide movement based on the Christian way of life.

**Youth Hostels**. With the increasing popularity of hiking and cycling holidays, there has arisen a need for good overnight accommodation for the traveller. This has been satisfied, to a large extent, by the Y. H. organisations which have been estab. in many countries. The International Y. H. Federation comprises over twenty associations, and under a reciprocal arrangement, encourages their members to use hostels in any country within the Federation. On the continent the movement first assumed an

organised form under the direction of Richard Schirrmann in Germany, and a few of the associations later became state controlled. Y. H. are designed primarily for the use of young people, but in most countries there is no upper age limit. The buildings used vary from mansions to mt. huts, but all provide simple accommodation, separate dormitories for men and women, cooking and washing facilities.

**England and Wales.**—The Y. H. Association was formed in 1930, and consists of nineteen semi-autonomous regional groups, each administering a number of hostels. In 1949 there were 208,425 members, and 293 hostels with 13,735 beds.

**Scotland and Ireland.**—The Scottish Y. H. A., founded in 1931, possessed 90 hostels in 1950, and in 1949 had 53,487 members. The Irish Y. A. A. (An Oige) has headquarters in Dublin, and the Y. H. A. of Northern Ireland in Belfast.

**Youth Organisations of Great Britain.** The standing conference of National Voluntary Youth Organisations (with headquarters at 26, Bedford Square, London, W.C.), was founded in 1936 by a number of the leading youth organisations. The conference meets to discuss matters of common interest to its constituent organisations and to strengthen the voluntary principle in youth work. It also makes representations or recommendations to statutory authorities or to other appropriate bodies. The Y. O. which are members of the standing conference are non-political and work directly with young people in organised units under accredited leaders. Each has a national adolescent membership of over 10,000 and the total membership, under 20, of these organisations amounts to nearly 2,000,000. Some of the movements are organised on an international scale. Training of youth leaders is given at various univs. or univ. colleges; these include the univs. of Durham, Bristol, Nottingham, the London School of Economics and Political Science, univ. college of Swansea.

**Yperite**, see MUSTARD GAS.

**Ypres, John Denton Pinkstone French**, first Earl of (1852–1925), Brit. soldier, b. at Ripple, Kent. He was educated at a preparatory school at Harrow, and Eastman's Naval Academy, Portsmouth. He joined H.M.S. *Britannia* in 1866, and served in the Royal Navy for four years. He was commissioned in the 8th Hussars in 1874, soon transferring to the 19th; he took part in the Sudan campaign, 1884–85, and was present at Abu Klea, Gubut, and Metamnah. He fought with distinction in S. Africa, and in 1900 was appointed to the command in the E. Transvaal, and took part in the operations against the rebels in Cape Colony until the end of the war. He commanded the 1st Army Corps at Aldershot, 1901–07, and was promoted lieutenant-general, 1902. He was made field-marshal in 1913, being appointed commander-in-chief of the B.E.F. at the beginning of the First World War. His failure, at Neuve Chapelle and Loos in 1915 to pierce the Ger. line

was very costly, and he was recalled and given command of all the forces in the United Kingdom. See further under FRANCE AND FLANDERS, FIRST WORLD WAR, CAMPAIGNS IN. He was Lord-Lieutenant of Ireland from 1918 till 1921. He had been created viscount in 1916; he was made Earl of Ypres in 1921. See life by his son, G. French, 1931.

**Ypres** (Flemish *Yperen*), tn. of W. Flanders prov., Belgium, on the Yperle (Yperle). It was famous in the Middle Ages as a centre of the Flanders cloth trade. Its many fine medieval buildings, the markets, including the famous Cloth Hall (1201–1342), St. Martin's Church (thirteenth century), the Gothic meat-market, Renaissance town hall, and Templars' houses, were destroyed during the First World War. Afterwards, many of the buildings were restored. The Menin Gate (1927) is a memorial to Brit. troops missing in the fighting around Y. in the First World War. Its woollens were noted in the fourteenth century, but the chief manufs. are now linen and biscuits. Pop. 14,000.

**Ypres, Battles of** (1st Battle, Oct. 19–Oct. 31, 1914; 2nd Battle, April 22–May 25, 1915; 3rd Battle, July 31–Nov. 10, 1917). Many of the most important actions of the First World War took place in the Ypres sector, which was held continuously by Brit. troops. Gun-fire and shells soon reduced the tn. to ruins. The Brit. occupied the place in the middle of Oct., 1914, and the *first* battle lasted for a month, the Gers. making great efforts to recover the prestige they lost at the Marne. On Oct. 31, the Worcestershire Regiment defeated overwhelming numbers of Gers. who almost broke through at Gheluvelt, thereby saving the Channel ports from capture. The Gers. estab. themselves, however, in sev. vils. in the sector. The *second* battle commenced in the spring of 1915 by the Brit. capturing Hill 60 (q.v.) after it had been heavily mined. The Gers. counter-attacked furiously, using poison-gas for the first time. Their much-advertised objective was Calais; they broke the Fr. line N. of Ypres, but were checked by the end of April. During May they launched heavier and heavier attacks with gas, and gained ground, recapturing Hill 60, gaining possession of Polygon Wood, and pushing back the Brit. in the regions of the Roulers railway and Menin road. At the end of the battle the Brit. were still holding Ypres, although the Gers. had made some small gains at great cost to themselves. The *third* battle opened on July 31, 1917, with an attack by the Brit. on a 15-m. front which was very successful. On Aug. 16, another attack on a 9-m. front N. of the Menin road resulted in the capture of Langemark, and the Fr. on the left also made progress. A few days later the advance was continued in a N.E. direction with further success. On Sept. 20 another attack was launched up the Menin road. The Gers. counter-attacked, unsuccessfully. The last phase of this battle was the capture of the Passchendaele ridge

by the Canadians in Nov.; heavy fighting followed which resulted in the Brit. gaining more ground. *See also under* FRANCE AND FLANDERS, FIRST WORLD WAR, CAMPAIGNS IN, WORLD WAR, FIRST; MENIN GATE; NEUVE CHAPELLE; PASSCHENDAELE.

**Ypsilanti**, or **Hypsilanti**, noble Gk. Phanariot (Fanariot) family of the eighteenth and nineteenth centuries, who claimed descent from the Comneni, and rose to great power in Constantinople.

**Yssey, Eugène** (1858-1931), Belgian violinist and composer, b. at Liège, of Walloon stock. In 1886 he became prof. at the Brussels conservatoire. The Sonata by Lokou (*q.v.*) (dedicated to him) owes its fame to Y.'s interpretation; he was also known for his interpretations of the works of César Franck, Bach, Corelli, Vitali, and Geminiani. In 1929 he produced an opera, *Peter the Coalminer*, in Walloon dialect, with libretto by himself.

**Yser**, riv. of France and Belgium, rising in the dept. of Nord, France, and flowing into the N. Sea at Nieuwpoort (Nieuport). It was the scene of a battle in Oct.-Nov. 1914 between Allied and Ger. forces. *See further under* WORLD WAR, FIRST.

**Yssel**, *see* LISSEL.

**Ysselmonde**, *see* LISSELMONDE.

**Ytterbium** (symbol Yb, atomic number 70, atomic weight 173.5), rare-earth element. Margnac in 1878 obtained what he thought was pure Y. in certain minerals, e.g. gadolinite. Urbain and von Welsbach, 1907-08, split this up into lutecium and neo-ytterbium (*i.e.* what is now called Y.). Y. forms an oxide Yb<sub>2</sub>O<sub>3</sub> and sev. salts such as the sulphate Yb(SO<sub>4</sub>)<sub>2</sub>.

**Yttrium**, symbol Yt, atomic number 39, atomic weight 88.92, a rare metallic element allied to aluminium. It yields colourless salts, and forms an oxide, Yt<sub>2</sub>O<sub>3</sub>. Although not a rare-earth metal, it resembles that group.

**Yü** (c. 2197 B.C.), mythical Chinese emperor, the last of the three famous 'ancient kungs' of great virtue, the others being Yao and Shun. He constructed many valuable defences against flood. His reign, which is said to have begun in 2205 B.C., marks the beginning of the first, or Hsia, dynasty.

**Yuan**, *see* YÜEN.

**Yucatán**: 1. Peninsula of Central America, in S.E. Mexico. Length, 400 m.; mean breadth 200 m.; coastline, 700 m.; area, 55,400 sq. m. The coast on the N. and W. is low and sandy, but higher and more indented on the E. The dist. contains many relics of the Maya civilisation. *See* W. von Hagen, *Maya Explorer*, 1947. 2. State of the S.E. part of Mexico, being one of the States forming the Y. Peninsula. It is bounded on the N. by the Gulf of Mexico, E. by the state of Campeche, and W. by Campeche and the gulf of Mexico. The soil is poor and rocky, with no rivers, and mostly flat, but towards the boundary with Campeche and in the S. it is somewhat hilly. The climate is tropical in the summer, but from Oct. to March, is equable. There is little malaria in Y. now, and the yellow fever has been

exterminated. There is rail communication with Campeche, but communications in Y. are not generally good. The main products are sisal fibre and hard woods. There are some small sugar mills in the S. Only one crop of corn a year can be obtained, owing to the scarcity of rain. Merida is the cap., and has been extensively modernised. Area, 23,296 sq. m. Pop. 418,200.

**Yucca**, or **Adam's Needle**, genus of slow-growing evergreen shrubs (family Liliaceae) bearing, when fully-grown, a huge erect panicle with pendulous flowers from the centre of a circle of thick linear leaves. *See also* JOSHUA TREE.

**Yuen**, or **Yuan**, Mongol dynasty which ruled China from 1280 to 1367. It was founded by Kublai Khan (*q.v.*).

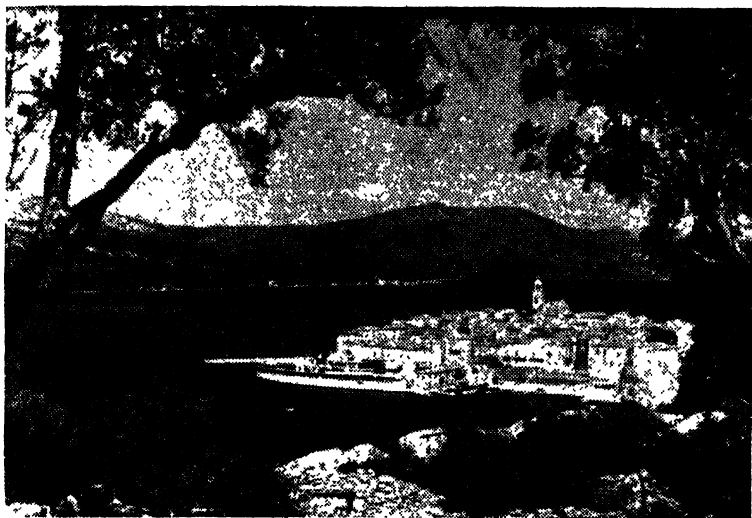
**Yugoslavia**, federal republic of E. Europe. Its area is 96,265 m. According to the census of March, 1948, the total pop. was 15,751,900. The country consists of the following federal units: Serbia, pop. 6,523,200 (cap. Belgrade, which is also the cap. of the federal republic); Croatia, pop. 3,719,000 (cap. Zagreb); Slovenia, pop. 1,389,100 (cap. Ljubljana); Bosnia and Herzegovina, pop. 2,562,000 (cap. Sarajevo); Macedonia, pop. 1,152,100 (cap. Skopje); Montenegro, pop. 376,600 (cap. Titograd, formerly Cetinje and the old Podgorica). In addition Serbia includes the autonomous prov. of Vojvodina (prin. tn., Novi Sad) and the autonomous region of Kosovo-Metohija (prin. tn., Pristina). (For detailed information of the geography, products, and races of the various federal republics in Y., *see* BOSNIA AND HERZEGOVINA; CROATIA-SLAVONIA; MACEDONIA; MONTENEGRO; SLOVENIA; and SERBIA.)

Y. is bounded on the N. by Austria and Hungary, on the E. by Rumania and Bulgaria, on the S. by Greece and Albania, and on the W. by the Adriatic Sea and Italy. 75 per cent of the surface is occupied with mts. and plateaus, and only 25 per cent by lowland, karst, and riv. depressions. The largest Yugoslavian Adriatic is. are Krk, Brač and Cres. The most important rivers are the Danube, the Sava, the Morava, the Drina, and the Drava. The climate is predominantly continental, but Mediterranean influences penetrate a considerable distance into Montenegro and Herzegovina.

**Agriculture**.—Y. is primarily an agric. country, and the cultivated area exceeds 36,000,000 ac. About 80 per cent of the pop. obtain their livelihood from the land. After the Second World War, large private estates were dissolved, and it was stated that 316,435 households received shares of the confiscated land. State farms were formed from the agrarian land-pool. Intended especially to provide opportunities for scientific research with a view to increasing the amount and quality of production by the adoption of modern methods. There are sev. types of agric. co-operative; in some the land remains the private property of co-operative members. But in the 'real socialist farm,' the land is the property of the co-operative. In

1949 there were 4,535 peasant working co-operatives in Y. with 1,241,065 hectares of arable land. It has been admitted, however, that despite all the apparent advantages of the co-operatives, many peasants have been unwilling to join them, and that many individual 'un-economic' holdings still exist. Agric. methods in Y. are still primitive in many parts, though modern mechanical equipment is being introduced on an increasing scale.

is rich in minerals. A Five Year Plan which started in 1947 envisaged great developments in every field of Y.'s economy. The chief secondary industries are flour-milling, cotton-spinning and weaving, brewing, distilling, and the production of beet-sugar, wines, chemicals, leather, pottery, carpet-making (as for example at Pirot, in Serbia). The export trade is carried on chiefly in timber, grain, eggs, cattle, pigs, and copper. In 1948 trade between the United King-



*Yugoslav Embassy*

#### CURZOLA (KORČULA), ISLAND AND TOWN ON THE ADRIATIC, DALMATIA

Cereals, especially wheat and maize, are produced; other products are sugar-beet, hemp, and all kinds of fruit, particularly plums and the vine. Sub-tropical crops such as cotton, olives, and poppy-seeds can also be grown in certain areas. Stock-raising is carried out on a large scale. In addition, the Adriatic provides valuable fishing-grounds. The great forest areas are being developed by the gov.

**Minerals and Industries.**—The mineral wealth of the country is great, but as yet little exploited, though the Tito gov. has begun schemes involving mineral development. There are deposits of coal, iron, gold, copper, lead, asbestos, asphalt, chrome, antimony, salt, bauxite and other non-ferrous metals, as well as some oil, etc. Industry as a whole has great scope for further development and extension on more up-to-date lines, and under the Tito regime the State has intervened on a large scale and industries have been forcibly modernised and expanded. Serbia and Croatia are the most industrialised parts of Y. Bosnia

and Y. was as follows: Yugoslavia imports from United Kingdom £4,560,000. Yugoslav exports to the United Kingdom £2,741,000. Between 1945 and 1947 trade with the U.S.S.R. and E. Europe was considerable: since then it has declined, and trade with W. Europe has undergone a corresponding revival. Major industries and public utilities in Y. are nationalised.

**Constitution and Justice.**—In Jan. 1946 a new constitution was adopted. This declared Y. a Federal People's Republic comprising the six republics of Serbia, Croatia, Slovenia, Montenegro, Macedonia, and Bosnia-Herzegovina, the autonomous prov. of Vojvodina and the region of Kosovo-Metohija. The two-chamber Parliament is elected for four years and it in turn elects the president of the Federal Presidency, who is the nominal head of the State. The president of the council of ministers and minister of national defence is the effective head. In 1950 this post was held by Marshal Tito (*q.v.*). This constitution declared church and state separate, and gave the suf-

frage to women. The judicial system was reformed after the estab. of the People's Republic. Each republic has its supreme court and network of lower courts in the cos. and dists.: above these is the supreme court of the Federal People's Republic. Judicial personnel are dependent on the gov. Each of the constituent republics of Y. is given a large measure of autonomy by the constitution, with its own assembly and presidium, subject only to the federal gov. But in practice all effective gov. appears to come from Belgrade.

**Religion and Education.**—The Orthodox, Rom. Catholic, Jewish, Moslem, and Protestant faiths are recognised by the State and enjoy equal rights. Religious education is no longer compulsory. The 1931 census showed that there were 6,786,500 Orthodox members; 5,217,900 Rom. Catholics; 231,000 Protestants; 1,561,000 Moslems, and 68,400 Jews, but since this date the boundaries have changed and the pop. has increased. Until recent years religious differences were a main factor tending to disunity in Y. Since 1945 pressure has at various times been put on different religious groups, especially the Rom. Catholics. Primary education is compulsory and free. There are univs. at Belgrade, Zagreb, Ljubljana, and Skopje. In 1946 there were 10,400 primary schools, with 1,388,000 pupils, and over 400 continuation and nearly 700 technical schools, with over 300,000 pupils. The Tito Gov. has initiated an intensive campaign against illiteracy, and claims that all Yugoslavs will be able to read and write by 1955.

**Communications and Towns.**—There are 10,817 km. of railway lines and 33,730 km. of roads. Under the Federal Republic, sov. schemes for extending the railway and road network have been begun, including the 'Youth Railway' of 242 km. between Samač and Sarajevo built by organised bands of students, 217,000 being employed on it.

The prin. Adriatic ports are Split, Dubrovnik (formerly Ragusa), Susak, and Kotor. In Dalmatia, Opatija, Crkvenica, and Makarska, and on the S. coast of Montenegro Budva, Ucinje and the bay of Kotor are favourite tourist places. There are also sov. mineral springs in Y. The best-known holiday resorts are Rogaska Slatina, Dobrna, Lasko, Rimske Toplice, and Slatina Radenci in Slovenia, and Vrnjacka Banja, Vrnjci, and Niška Banja in Serbia.

**Defence.**—It is understood that the peace-time strength of the three armed services is at least 300,000 officers and men. The war-time strength was about 1,250,000. In 1945 the National Liberation Army became the regular Y. army. In 1950 it was estimated that the Y. air force consisted of up to 1000 machines. Present figures for naval vessels are not known.

**History.**—(For hist. until 1918 see under SERBIA; CROATIA-SLAVONIA; MONTENEGRO; MACKEDONIA.) Y., until 1929 known as the Kingdom of the Serbs, Croats, and Slovenes, was created after the First

World War from the former kingdoms of Serbia and Montenegro; Bosnia, Herzegovina, Dalmatia (except a small part which went to Italy), and parts of Styria, Carniola, and Carinthia from Austria; and Croatia, Slovenia, and Vojvodina (parts of Baranja, Baška, and Banat), from Hungary. It was declared a constitutional parl. monarchy under the hereditary king of Serbia, but dissension between Serbs and Croats broke out, and King Alexander I. (see ALEXANDER), therefore, in Jan. 1929, abrogated the constitution, dissolved Parliament, and formed a cabinet composed of sixteen members, responsible to himself alone. At the same time the country was renamed Y., and a new system of regional administration adopted. This period ended with the dictated constitution of 1931, which vested the legislative powers in the king, the senate, and the chamber of deputies. In 1934 Alexander was assassinated. During his son Peter's (b. 1923) minority, Alexander's brother Prince Paul was regent. Soon after the outbreak of the Second World War the subjugation of Y. became a necessity to Ger. strategy, and under great pressure, Prince Paul's Gov. on March 25, 1941, signed the tripartite anti-Comintern Pact (q.v.). This action was repudiated by the mass of the people. A new gov. was set up under King Peter and Gen. Simović which actively resisted the Gers.; but Y. was unprepared for an invasion and the Ger. army penetrated the Monastir gap and eventually occupied Belgrade (after bombing it heavily) on April 13 (see further under EASTERN FRONT or RUSSO-GERMAN CAMPAIGN IN THE SECOND WORLD WAR). In 1944 the defection of Rumania and Bulgaria, brought about by the Russian victories, put the Ger. armies in Y. and Greece in great danger. These armies began a difficult withdrawal, harassed by partisan forces which had carried out guerrilla attacks on the Gers. throughout their occupation of the country. The gov. of Peter II. in exile had appointed a Serb. Gen. Mihailović (Mihalovich) (q.v.) commander-in-chief of what remained of the Yugoslav army in the fatherland and had given him the post of minister of defence. A rival force to Mihailović's Četniks (Chetniks) arose under the leadership of Tito (q.v.) a Croatian Communist. Up to mid-1943 allied assistance was given to Mihailović, and then also to Tito, whose influence was increasing. In 1944 allied support was henceforth given exclusively to Tito, whose rise to supreme power was henceforward uninterrupted, and effected with Soviet aid. In June 1946 Mihailović was tried as a collaborator and shot.

The constitution of 1931 was formally abrogated at Belgrade in Nov. 1944, when the Yugoslav Premier Subasić and Tito for the 'National Liberation Committee of Yugoslavia' signed an agreement recognising the provisional legislative powers of the National Liberation Council. In 1945 Marshal Tito was acclaimed at the general election, and the exiled Peter II. was deprived of his nationality and had

his property confiscated. In 1946 the constitution of the Federal People's Republic of Y. was adopted, and action taken to make Y. a fully-Communist state. Industries and commercial undertakings were nationalised.

In 1939 the illegal Communist party had 20,000 members. Many were killed during the war; but in 1950 the membership had risen to over half-a-million,



Yugoslavia Embassy

#### A GIRL FROM SLOVENIA

including large numbers of peasants, who had fought under Tito against the Gers. Unlike Mihailović, whose bias was not only monarchist but pro-Serb, Tito rallied all sections of Yugoslavs without racial distinction, insisting only on political uniformity, and achieved a unity which the monarchy had never been able to obtain. The poor were undoubtedly attracted by Tito's attacks on the large property-owners. The monarchy had not really attempted to deal with the pressing land problem. The social revolution which was carried out in Y. from 1945 altered the balance of Yugoslav society. The large property owners and some of the professional classes suffered a loss in status as well as income: on the other hand, the need for doctors, skilled engineers, architects and teachers became greater than ever before, and writers and artists enjoyed a privileged position, providing that they conformed to the gov.'s political policy. Industry has been largely nationalised, and craftsmen encouraged to enter co-operatives. The Five Year Plan launched in 1947 hoped to double the national income of 1939 by

1951, and aimed at the industrialisation of the country on a large scale by exploiting the rich deposits of raw materials and by setting up huge electric plants, etc. Great efforts were being made to increase output both by modernising equipment and methods, and by giving awards for individual efforts. Sev. building projects were commenced, though it was believed that greater importance was attached to the building of gov. offices and state factories than to private houses. In 1950 housing conditions were reported to be very bad. The economic blockade against Y. by the Cominform countries from 1948 appeared to threaten the Five Year Plan, but Tito then made trade agreements with sev. W. European countries, and claimed that the plan would not be affected. In autumn 1950, however, it was apparent that a bad harvest had added substantially to the economic difficulties under which Y. was labouring.

The peace treaty with Italy, signed in Paris in Feb. 1947, stipulated the cession to Y. of most of the lt. prov. of Venezia Giulia, the commune of Zara, and the is. of Pelagosa. The Free Ter. of Trieste was constituted under section III. of this treaty as a compromise to the city and its port. (See further under TRIESTE.)

Early in 1948 a bitter political conflict between Y. and Russia broke out when the Kremlin, acting through the Cominform (q.r.) called on Yugoslav Communists to depose certain of their leaders who refused to be bound by Moscow's discipline. Later, in 1949, the Soviet Gov. directly challenged and threatened the authority of the Yugoslav Gov. Political and economic life in Y. in 1948-49 was completely dominated by Tito's quarrel with the Cominform (see also under TITO). Early in the dispute the Cominform had expelled Tito and urged the Yugoslav people to throw him out of office if he did not change his policy, but the quarrel had the effect of arousing the nationalism of the Yugoslavs and gave Tito support from sections of the pop. who were probably antagonistic to his economic policy. The Russians then instigated an economic blockade of Y. The tense situation continued into 1950, when Tito's position was still apparently strong. Y. had successfully asserted her independent status against Soviet claims: but while economic necessity forced her to trade with the W., her domestic policy continued to be conducted on Marxist lines, though with the emphasis on the 'peasant proletariat' rather than on the urb. workers, and with a rather less stringent censorship than that imposed in other Communist states.

*Language and the Arts.*—The languages recognised in Y. are Macedonian, Slovene, and Serbo-Croat. The last-named had a distinctive position under the monarchy and would still appear to have a certain prestige, since it is spoken by the largest number of the pop. (see further under separate articles: SERBIA: *Serbo-Croat Language and Literature*; SLOVENES; MACEDONIA.)



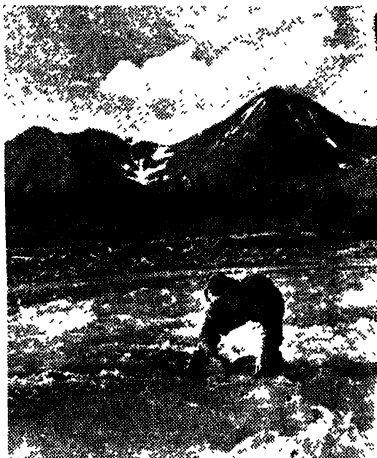
For literature and the arts prior to the formation of the Federal People's Republic see separate articles. There have been no notable developments in literature since the end of the Second World War, most productions being propagandist and of no great literary merit. Oton Zupancić (1878-1949) the national poet of Slovenia, d. after producing a sequence of fine war poems. The Second World War inspired a wealth of new folk-songs, while orchestral works have been written by the Croat composer Stepan Sulek, the two Serbian composers Jovan Hanđura and Mihailo Vukdragović, and the Slovene composers Blaža Arnič, Marijan Kozina, and Bela Kraljina. There has also been a great revival of interest in opera, and new operas have been written by Mirko Pobič, Marijan Kozina and Danilo Svara, and a new ballet by Stevan Hristić. The Yugoslav Academy of Arts and Sciences in Zagreb has renovated and re-organised its picture gallery, giving space to modern painting and sculpture. The arts in Y. since the Second World War have had little contact with the outside world. This has resulted in much highly nationalistic work being produced. Technical skill, e.g. in the film industry, is low. The Tito gov. has encouraged the culture of the separate republics in the Federal Republic, and peasant culture has had a great revival.

See also BALKANS.

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**Yukon**: 1. Ter. of N.W. Canada, with an area of 205,346 sq. m. (land) and 1730 m. (water). The N. and W. are mountainous, but in some places the valleys can be utilised for growing crops. The chief forest trees are spruce, poplar, birch, cottonwood, and balsam. Y. owed its prosperity to the discovery of the gold mines in the Klondike region, and mining is the prin. occupation. Silver and lead are the other chief minerals. Total mineral output to the end of 1946 was 242½ m. dollars. All the mining operations take place some distance outside Dawson City in the Klondike valley and its trib. creeks. In 1947, 47,750 oz. of gold valued at £417,800 was recovered

in the Y. T. Fishing and lumbering are other industries. Fur output averages 500,000 dollars annually. Within the boundaries of the Klwan Lake Federal Game Sanctuary is the Mt. St. Elias range, with Mt. Logan (19,539 ft.). The Y.T. was constituted a separate political ter. in 1898. It is governed by a resident controller under the direction of the minister of mines and resources in Ottawa.



National Film Board, Canada

#### YUKON

Panning for gold, near Whitehorse.

The seat of gov. is Dawson City (pop. 1000). The pop. of Y. T. is about 4900, having declined considerably from over 27,000 in 1901. There are 58 m. of railway, but the Y. River is the greatest channel of communication from the coast to the interior. There are 2000 m. of motor and other roads in addition to the Alaska Highway. (See under ALASKA.) See N. A. D. Armstrong, *Yukon Yesterdays: Thirty Years of Adventure in the Klondike*, c. 1906; *Yukon: The Land of the Klondyke*, 1929, and *The Yukon Territory: Administration, Resources, Development*, 1947, both pub. by the dept. of Mines and Resources, Ottawa. 2. Riv. of the Yukon ter. and Alaska, formed by the junction of the Lewis and Polly rivs. Length 2300 m. The riv. is navigable in the summer, for 3-ft. draft steamers from Whitehorse to the Behring Sea (1770 m.). It was first explored from source to mouth in 1883 by F. Schwatka.

**Yunnan**, S.W. prov. of China, bounded on the N. and E. by Szechwan, Kweichow, and Kwangsi, and on the S. and W. by Indo-China, Burma, and Tibet. Area 162,300 sq. m. The surface is mainly a lofty, uneven plateau, broken by mt. ranges and the gorges of rivs. The mts. are highest in the N. where they reach

17,000 ft., sinking to 7000 or 8000 in the S. The chief rvs. are the Salween, Yang-tsekiang, and Me-kong. The plains and valleys are fertile, and agriculture and stock-raising are largely carried on, particularly in the S. and S.W. Excellent tea, tobacco, and silk are produced. The mineral wealth is considerable and includes copper-ore and tin ore, which

have been mined for many years, gold, silver, lead, tin, jade, and anthracite. Pop. 9,171,000. The cap. is Kunning (Yunnan-fu). Among the prin. roads in China is that which runs from Kunning in Y. to Lashio in Burma (the Burma Road).

**Yusuf-ibn-Tashfin**, *see under* ALMO-RAVIDES.

## Z

**Z**, twenty-sixth and last letter of the Eng. alphabet. In the N. Semitic alphabet (as well as in modern Heb.) it occupies the seventh place; in the Gk. alphabet it occupies the sixth place. The Etruscans took it over from the Gks., and the Romans borrowed it from the Etruscans. Thus, the early Lat. alphabet contained the letter **Z** (𐌶), which then occupied the seventh place, but at a later stage it was dropped, because Lat. did not require it, and the letter **G**, created in 312 B.C. out of the letter **C**, was placed in its position. When, after the conquest of Greece (first century B.C.), Gk. words were largely borrowed by the Lat. language, a new **z** (**Z**) was adopted for the sound *z* (but only to transliterate Gk. words) and was placed at the end of the Lat. alphabet, from which it has been transferred to all the alphabets of W., S., N. and Central Europe. The phonetic value of *z* is that of a voiced sibilant, like the *s* in 'singer,' but in some languages it may have the value of *ds* or *ts*. In chemistry, **Zn** and **Zr** are the atomic symbols for the metals zinc and zirconium, respectively.

**Zaandam**, port and tn. in the prov. of N. Holland, the Netherlands, on the Zaai, 5 m. N.W. of Amsterdam. It has a great number of saw-mills, and manufs. paper, glue, and dyes. Pop. 41,400.

**Zabalkanski, Count**, see DIEBITSCH-ZABALKANSKI.

**Zabern**, see SAVERNE.

**Zabkowice Slaskie**, see FRANKENSTEIN.

**Zabrze**, tn. of Polish Silesia. Before the Second World War it was a Prussian tn. which in 1915 was renamed Hindenburg. It lies 8 m. W. of Chorzow (Königs-hütte), and has coal-mines, cable works, and breweries. Pop. 126,100.

**Zacatecas**: 1. State of Mexico; area 28,120 sq. m. It is rich in silver and other minerals, including gold, copper, and zinc. In the N. and E. are extensive cattle ranches. Pop. 565,400. 2. City, cap. of Z. state, a centre for silver mining. It has a cathedral, and a mint. It became a city in 1585, being founded in 1546. Pop. 21,800.

**Zachariah**, father of John the Baptist. All that is known of him is contained in Luke i. He was about to offer incense as priest in the Temple, when the angel Gabriel appeared to him and foretold that his ageing wife Elizabeth should bear a son. **Z.** was struck dumb. After the birth of the child he named it John, and recovering his speech uttered the well-known *Benedictus* Canticle.

**Zacharias, St.** (d. 752), pope, b. in San Severino, Calabria, of Gk. parentage. He succeeded Gregory III. as pope in 741, and in that capacity exercised considerable political influence. He negoti-

ated peace between the Lombards and the Gks., confirmed Pepin the Short as king of the Franks, encouraged the missionary work of St. Boniface, and did much for the Benedictine order. His feast day is on March 22.

**Zacharias**, minor prophet, see ZECCHARIAH.

**Zackynthos**, see ZAKYNTHOS.

**Zadar** (It. **Zara**), seaside resort and port of Croatia, Yugoslavia, on the Adriatic, 52 m. S.E. of Trieste. It manufs. maraschino, glass, and wax. There are fisheries. **Z.** was the Rom. colony of Iadera. In 1797 it passed to Austria, becoming It. after the First World War. Under the It. peace treaty, June 1947, **Z.** was ceded to Yugoslavia. It was seriously damaged during the Second World War. **Z.** has a cathedral, dating from 1202, and sev. other anct. churches. Pop. 14,800.

**Zadkiel**, pseudonym of **Richard James Morrison** (1795-1874), Eng. astrologer, who founded in 1831, *The Herald of Astrology*, which, afterwards issued yearly as *Zadkiel's Almanac*, attained great popularity.

**Zagan** (Ger. **Sagan**), tn. in Silesia, Poland, on the Bobrow (Bober), 34 m. W.S.W. of Glogów (Glogau). It has manufs. of cotton and woollen goods, malt liquors, pottery, and glass, and has iron-foundries. Formerly in Germany, it became Polish after the Second World War. Pop. 14,200.

**Zaglul Pasha** (1860-1927), Egyptian politician, b. at Ibbana in the Delta. See under EGYPT, *Modern History*.

**Zagreb** (Ger. **Agram**), tn. and cap. of Croatia, Yugoslavia, near the l. b. of the Save. It is an important railway junction, 70 m. from Fiume. **Z.** became the cap. of Croatia-Slavonia in 1867, and is the political and cultural centre of the Croats. There are manufs. of tobacco, leather, paper, and textiles in the 'new town.' The 'old town' includes many fine eccles. buildings, among them the thirteenth-century church of St. Mark, and the fifteenth-century cathedral. Pop. 290,400.

**Zaharoff, Sir Zacharias Basileios** (1850-1936), financier, b. at Mughla, Turkey in Asia, of mixed Russian and Gk. parentage. He was educated at the Eng. school, Constantinople; there he entered his uncle Sevastopoulos's business of cloth-merchandise. In London, in the early 'seventies, Sevastopoulos tried to have **Z.** extradited for embezzlement, but the charge failed.

**Z.** went to Athens, and in 1877 became agent for the Swedish armament firm of Nordenfält. Agent of Vickers firm in Spain in the 'eighties; director and chairman of Vickers-Maxim in the 'nineties. Associated with Nordenfält's and its Brit. successors; and said to be also connected

with Krupps, Schneider, Creusot, and Skoda concerns; engaged also in banking, oil enterprises, etc.

**Zaisan**, or **Dzaisang**, lake in the Semipalatinsk Region of the Kazakh S.S.R., situated between the Tarbagatai and Altai Mts. It receives the waters of the Black Irtysh and empties itself into the Irtysh. Area about 700 sq. m.

**Zakopane**, spa and fashionable winter sports resort in the Tatras Mts., Poland. It contains sev. sanatoria. Pop. 17,700.

**Zakynthos** (It. **Zante**; anc. **Zacynthus**). 1. One of the Ionian is. and a nomos of Greece, 8 m. S. of Cephalonia. It produces pitch and gypsum. Fruit is grown. Area 277 sq. m. Pop. 44,800. 2. Tn. and cap. of above, on the E. coast. There are sev. anc. churches. Currants, soap, and fruit are exported. Pop. 12,700.

**Zama**, anc. tn. in Numidia, N. Africa, 70 m. S.W. of Carthage, scene of Scipio's victory over Hannibal (202 B.C.) which ended the Second Punic War.

**Zambales**, prov. in the W. of Luzon, Philippines. It is crossed by the Zambales Mts. Indigo, sugar-cane, rice, and tobacco are cultivated. There are chromite mines. The cap. is Iba. Pop. 140,000.

**Zambesi**, or **Zambezi**, riv. of Africa, extending mainly through N. and S. Rhodesia—being the territorial boundary between the two countries from near Shesheke to Ferra (N. Rhodesia)—and Mozambique, about lat. 16° S. It has a length of about 1600 m., but its navigation is poor in proportion to its size. It has three navigable sections, but they are divided by impassable barriers. Its drainage area is about 520,000 sq. m. It rises on sev. streams in N.W. Rhodesia, Angola, and the Belgian Congo. Its general course is S.E. through the Barotsi Valley to the Victoria Falls (q.v.); from here the riv. bends N.E. and E. nearly to Tete (Mozambique), when it resumes a S.E. course to the delta, situated some 200 m. N.E. of Sofala in the Mozambique Channel. Its volume is largely increased by the Shire bringing the waters of Lake Nyasa. The riv. is navigable for 120 m. from its mouth, though with difficulty in the dry season, and for special riv. steamers (stern-wheel) up to Tete and on the R. Shire to Chipimo (Nyasa-land). Below Tete the Lupata Gorge has a width of about 200 yds. and a very strong current. Features of the Z. in its upper reaches are the Kanzalo Rapids and the Kariba Gorge in S. Rhodesia. The chief tns. or townships on its banks are: Kazombo (in Angola near the source), Balovale, Lealui, Livingstone, Meumba, Boruma, and Ferra all in N. Rhodesia, and in Mozambique: Zumbo, Chikoa, Tete, Benga, Sena, Inyangoma, Mojeia, Chinde, and Quilimane. Livingstone was the first explorer of the upper riv., between 1851 and 1853; he discovered the Victoria Falls (1855) during his descent of the riv. to its mouth. See D. and C. Livingstone, *Expedition to the Zambezi and its Discovery of Lakes Shirwa and Nyasa*, 1865; and Lord Hailey, *Africa Survey*, 1938.

**Zamboanga**, cap. and port of the Mindanao is., in the Philippines. It was originally an old Sp. fortress. Copra, coffee, hemp, sugar, etc., are exported. Pop. 137,700.

**Zamenhof**, Ludwig Lazarus (1859–1917), Polish-Jewish inventor of Esperanto (q.v.), b. at Bialystok. See life by E. Privat, 1923 (trans. 1932).

**Zamia**, genus of dwarf trees (family Cycadaceae). *Z. caffra* is the bread tree, its pith being used by the natives of S.E. Africa for food.

**Zamora y Torres**, Niceto Alcalá (1877–1949), Sp. statesman, b. at Priego and educated at Granada and Madrid univs. He held office in sev. govts. as a monarchist. Later, he became a republican, and Liberal leader. Z. was elected first president of Spain in Dec. 1931. With the formation of the 'Popular Front' the moderate and pacific counsels of Z. were ignored, and, in April 1936, a socialist motion in the Cortes censuring the president was carried and he resigned.

**Zamora**: 1. Prov. in León, Spain, on the Portuguese frontier. Area 4097 sq. m. It is watered by the Douro and its tribs. Its flocks produce much of Spain's merino wool. Pop. 311,500. 2. City and cap. of above prov., on the Douro, 40 m. N.N.W. of Salamanca. It has a Romanesque cathedral, and manufs. wines, woollens, and linen. Pop. 29,000. 3. Tn. in Michoacan state, Mexico, on the Zamora R., 200 m. W.N.W. of Mexico City. Pop. 15,000. 4. State of Venezuela E. of the Cordillera Merida. Cap. Barinas. Area 13,587 sq. m. Pop. 60,000.

**Zangwill**, Israel (1861–1926), Jewish Eng. novelist; b. in London. He studied at London Univ. and became a teacher and then journalist. *The King of Schnorrers* (1894), a grotesque tale of Jewish life in the E. End of London in the eighteenth century, made him famous. Z.'s best book, *The Children of the Ghetto* (1892) is a study of Jewish life in England. **Zante**, see ZAKYNTHOS.

**Zanzibar**, Brit. protectorate, is. and tn. off the E. African coast. The protectorate is composed of the is. of Z., the is. of Pemba (q.v.), and sev. small is. The is. of Z. is off the coast of Tanganyika near Bagamoyo and Dar-es-Salaam, being separated from the mainland by a narrow channel which, at one point, is about 23 m. wide. Pemba is 30 m. to the N.N.E. Z. is the largest coralline is. on the E. African coast. From Dec.-March, during the N.E. monsoon, it is hot and comparatively dry. Heavy rains occur in March-May, and Nov.-Dec. In 1948 Z. tn. had 76.01 in. of rain, and in 1949, 36.54 in. the average of 13 years being 64.74 in. The coolest period is that of the S.W. monsoon from June-Oct. The climate of Z. is tropical, but the heat is tempered by constant sea-breezes which blow with great regularity except during the change of the monsoons. Pop. (1948), 264,182 (European, 296; Arab, 44,560; Indian, 15,892; African, 199,860; others, 3,554). Distribution between the two prns. is: Z., 144,575; Pemba, 114,587. (45,300

of the pop. of Z. is, live in Z. tn.) With 250 persons to the sq. m. Z. protectorate is one of the most densely populated countries in Africa. The prevailing native religion is Moslem. There are Christian missions.

**Production and Industries.**—Apart from *entrepot* trade, a survival of the days when Z. was the emporium of E. Africa, the protectorate is mainly dependant on its agric. and marine products. The chief agric. industry is the cultivation of cloves. Cloves are produced by individual Arab, Indian, and African agriculturalists on their own plantations, and picking is done by hired African labour. Export is normally in the form of dried bulbs, or oil distilled mainly from the stems. The spread of 'Sudden Death' disease in clove trees has been engaging the attention of the gov. during the last few years, and a Clove Research Department has been set up. The cause of the disease has not yet been discovered, though the consensus of opinion ascribes it to a virus. The coconut industry is also important, coira being one of the main exports. It is largely produced by the Omani Arabs. Mangrove bark used in the tanning industry is also exported. Other exports are chillies, citrus and other fruits, and coltobacco. There are some thousands of head of cattle on both Z. and Pemba, and hides and skins are exported. There are three small forests, which yield 'Mvule' timber. Fishing is a prominent activity, the fish being mostly consumed locally, though dried shark is exported. The manuf. of coir fibre and rope by hand is fairly extensive in the coastal areas. Other industries are clove-oil distilling, coconut expression, and the manuf. of soap. In 1949 174,328 cwt. of cloves, valued at £843,993, were exported.

**Administration.**—The gov. is administered by the Brit. Resident, who exercises his functions under the Z. Orders in Council, 1924 and 1925. Important questions of policy are referred to an executive council over which the sultan presides and which consists also of the Brit. Resident as vice-president, the heir apparent to the throne, four *ex-officio*, and three official members. There is a legislative council on the usual colonial model presided over by the Brit. Resident, and consisting of four *ex-officio*, five official and eight unofficial members (of whom 3 are Arabs, 2 Africans, 2 Indians, and 1 European). The administrative problem is complex by reason of the many different communities from which the pop. is drawn, for it is composed of an Arab aristocracy, an Asiatic bourgeoisie, and an African proletariat. It is the administrative policy to develop amongst the people a system of local gov. through local councils, which are being set up in suitable areas.

**Social Welfare.**—There are in the protectorate over 50 primary schools and 3 secondary schools, with a total enrolment (1949) of over 9000. In addition, there are gov. training centres for men and women primary teachers. Primary education is free in the gov. primary schools, which admit only Arabs and

Africans. The usual type of rural native house is a substantial rectangular mud-walled hut covering an area of 1850 sq. ft. with a coconut palm roof. In the urb. localities the stone-built quarters are inhabited mainly by Indians and Arabs. In both stone and hutted quarters there is serious congestion and a lack of adequate drainage and ventilation; but a new town-planning decree has made it possible to ensure the orderly development of new, and the progressive improvement of existing, built-up areas. Under the ten year development programme, certain native residential areas have been reconstructed with model huts. A civic centre, with a theatre, coffee-house, women's clinic, post office, and a children's playground, fully equipped, has been constructed in the native area, and has proved very popular. A drainage scheme for Z. tn. is about to be put into operation (1950). Justice in Z. is administered by a high court with headquarters at Z. tn., which has full jurisdiction, civil and criminal, over all persons and matters in the protectorate. There are also classes of subordinate courts under resident magistrates and dist. commissioners with limited civil and criminal jurisdiction, and *kathis* and *mudiri* courts.

Z. tn. is situated on the W. coast of Z. is. It is the largest tn. in E. Africa, and has an Arabic character. It was once the greatest slave-market in the world. It has a magnificent harbour, which presents excellent facilities for shipping and trade generally. Pop. 45,300. Other tns. in the protectorate are Wete, Chake Chake, and Mkoani, all in Pemba Is.

**History.**—The beginnings of the hist. of Z. are lost in antiquity. It would appear probable that the is. of Z. and Pemba had a close connection with S. Arabia prior to the Christian era and that Bantu settlers from the mainland of Africa occupied the is. at about the same time. Thereafter traders from Arabia, the Persian Gulf, and the E. coast of India began to visit the place. In about the tenth century of the Christian era the inhabitants of Z., Pemba, and the adjacent mainland became converts to Islam. At the end of the fifteenth century Z. was ruled by a 'king' of 'Moorish' (i.e. mixed African and Asiatic) descent. Pemba was at that date said to be ruled by five 'kings' of similar origin. In the early days of the sixteenth century the Portuguese set about the conquest of the E. African littoral and made the islands of Z. and Pemba tributary to the Portuguese crown. Although the inhab. were more than once in a state of rebellion, Pemba remained tributary until the final expulsion of the Portuguese. On the other hand, Z. very soon ceased to pay tribute and thereafter its 'king' was treated as a friendly ruler, who permitted the Portuguese to erect a factory and a church in his dominions. Portuguese supremacy in E. Africa came to an end in 1698 with the capture of their fort at Mombasa by the Arabs of Oman. Thereafter Z. and Pemba remained under the nominal supremacy of Oman for rather

more than a century. After the accession in 1804 of Seyyid Said bin Sultan to the throne of Oman, definite measures were taken to assert Omani supremacy in E. Africa. In 1829 Seyyid Said transferred his cap. from Muscat to Z. Thereafter he made Z. his permanent residence and laid the foundations of the prosperity of the is. by promoting trade with European and Amer. countries and with the Lake regions of Central Africa and by the introduction of cloves and other economic crops into Z. and Pemba. At his death in 1856 he left his African dominions to his son Majid and those in Asia to his son Thuweil. A dispute arose between the two brothers which referred to the arbitration of Lord Canning, governor-general of India, who in 1861 made an award declaring the African possessions of the late Seyyid Said to be independent of Oman. Majid was succeeded in 1870 by his brother Barghash. In 1873 and 1875 Barghash concluded treaties with Great Britain which declared the sea traffic in slaves within and from Z. dominions to be illegal. In 1886 a *procès verbal* signed by Lieut.-Col. (afterwards Earl) Kitchener as delegate of Great Britain and delegates from France and Germany, and subsequently ratified by the delegates' respective govts., defined the maritime, littoral, and continental possessions of the sultan of Z. The is. of Z., Pemba, and Mafia were recognised as being under the sultan's sovereignty and certain strips of the coast between Cape Delgado and Lamu to a depth varying from 5 to 10 m. were recognised as forming part of his dominions. In 1888 Barghash's successor, Khalifa, granted to a Ger. E. African Company a lease of the whole of the coast line (including Mafia), of what is now Tanganyika. In the same year a similar lease was granted to the Imperial Brit. E. Africa Company (I.B.E.A. Co.) of the sultan's dominions to the N. of the Ger. concession. The Ger. Company's concession was eventually taken over in 1890 by the Ger. gov. who bought the sultan's rights for 4 million gold marks. The I.B.E.A. Co.'s concession was taken over by the Brit. gov. in 1895 and the ter. comprised therein is now known as the Kenya Protectorate. In 1890 Khalifa placed his dominions under Brit. protection and also abolished all traffic in slaves within those dominions. In the following year a regular gov. was constituted with a Brit. representative as first minister. On the death of the Sultan Hamed bin Thuweil in 1896, Seyyid Khalid, another member of the family, seized the royal palace and it was found necessary for Brit. warships to bombard the palace in order to compel his submission. Sultan Hamed was succeeded by Hamud bin Muhammad. In 1897 the status of slavery was finally abolished in Z. In 1906 the Brit. gov. assumed more direct control over the Protectorate and reorganised the gov. In 1911 Seyyid Ali, who had succeeded his father Sultan Hamud in 1902, abdicated and was himself succeeded by Seyyid Khalifa bin Harub, the present ruler of Z. In 1913

the control of the Z. Protectorate was transferred from the Foreign Office to the Colonial Office. In 1914 a Protectorate Council was formed with the sultan as president. This body was purely of an advisory and consultative nature and was replaced in 1926 by executive and legislative councils.

**Architecture.**—The architecture of Z. is distinctively saracenic, and in accordance with the wish of the sultan this traditional form has been scrupulously maintained in most of the public buildings. With narrow streets and tall houses, Z. presents a typically Eastern appearance. The houses are embellished with carved doors, for which the is. is justly famous. See R. F. Burton, *Zanzibar; City, Island, and Coast*, 1872; H. N. Ridley, *Spices*, 1912; C. H. Stigand, *The Land of Zinj; Its Ancient History and Present Inhabitants*, 1913; F. B. Pearce, *Zanzibar, the Island Metropolis of East Africa*, 1920; R. Said-Kheto, *Said bin Sultan*, 1929; W. H. Ingram, *Zanzibar, its History and its People*, 1931; R. H. Crofton, *A Pageant of the Spice Islands*, 1936; Sir R. Coupland, *East Africa and its Invaders*, 1938; also the following gov. pubs.: *Zanzibar Protectorate*, 1931; B. H. Binder, *Report on Zanzibar Clove Industry*, 1936; R. O. Williams, O.B.E., *The Useful and Ornamental Plants of Zanzibar and Pemba*, 1949; *A Guide to Zanzibar*, 1949; and G. E. Tidbury, *The Clove Tree*, 1949.

**Zaporogians**, see under COSACKS.

**Zaporozhie**, city of the Ukrainian S.S.R., cap. of the Region of the same name. It lies in the heart of the industrial area of the Don Basin, on the R. Dnieper. Z. was constructed after the revolution, being built on a strictly utilitarian geometric plan. The first Dnieper Dam at Z. was completed in 1932. It supplied electrical power to industry and agriculture in the Don Basin. A great aluminium plant was completed at Z. in 1932. It is also an iron and steel centre. The dam was destroyed by the retreating Russians in 1941 and the city heavily damaged in the fighting around it in 1943. A second dam was completed in July 1946. Pop. 289,000.

**Zaragoza**, see SARAGORSA.

**Zaratite**, or **Emerald Nickel**, basic carbonate of nickel. It occurs as emerald green, botryoidal, compact masses, in Galicia, Spain, the Shetland Is., Australasia, etc.

**Zarafshan**, see SAMARKAND.

**Zarate**, see URIBURU.

**Zarathustra**, see under ZOROASTRIANISM.

**Zaria**, prov. of N. Nigeria, with an area of 22,000 sq. m. It is watered by the Kaduna and its tribs. and its soil is fertile, the chief products being cotton and sugar. It is crossed by the Iddo-Kano railway. The tn. of Z. is the cap. of the prov.

**Zatchleven**, Cornelis, see SACHTLEVEN.

**Zatec**, or **Saač**, tn. of Bohemia, Czechoslovakia, on the Eger, 43 m. N.W. of Prague. It is a centre of the hop industry. Pop. 16,250.

**Zea**, see CEOS.

**Zealand**, or **Seeland** (Daf. *Sjælland*), largest is. of Denmark, is bounded by the Kattegat, the Great Belt, the Sound, and

the Baltic. It has a greatly indented coast, the Roskilde being the longest fjord. The surface of the is. is undulating and the soil fertile. Prin. city Copenhagen. Area 2860 sq. m. Pop. 1,483,000.

**Zealand** (Netherlands) see ZEELAND.

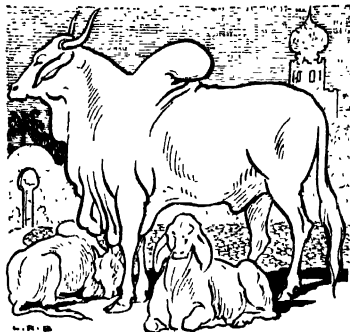
**Zealots** (Gk. *ζηλωται*, an enthusiasm), Jewish party in the period of two revolts against Rome. They were in full accord with the Pharisees in their devotion to the Law, but in politics they were much more intransigent and violent. To this party belonged Simon, one of the Twelve Apostles.

**Zebdani, Ez**, see EZ ZEBDANI.

**Zebra**, group of three equine species confined to the African continent. They are the true or mountain Z. (*Equus zebra*), Grévy's Z. (*E. greyi*), and Burchell's Z. (*E. burchelli*). Until the middle of the nineteenth century a fourth species, the Quagga, existed, but this is now extinct. The mountain Z. has short, clean legs, hard, well-shaped hoofs, and long ears. Its body colouring is silvery white with black or dark brown markings. It was formerly a rapidly vanishing species, but is now protected and is increasing in numbers. Grévy's Z. is a much larger animal and has finer and more numerous black or brown markings on a clear white ground. Burchell's Z. is intermediate in size, and its black or brown stripes are differently arranged. These, when broken in young, lend themselves more readily to domestication than the other species.

**Zebu**, see TRADESCANTIA.

**Zebu**, or **Bos indicus**, ox which existed formerly only in a domesticated state in India. Since the nineteenth century it



ZEBU

has been introduced into Australia, the U.S.A., etc. It is characterised chiefly by its large hump (sometimes two), over the withers and by a greatly developed dewlap. It is high at the shoulders, narrow at the hips, with long horns, long drooping ears, and loose skin which hangs from the neck, from the low barrel chest, and from the belly. The ebony skin is thin but dense, and the short, sleek hair may be white, grey, red, or black in colour.

The Z.'s vary greatly in size and are used in India as beasts of burden. They have been introduced into N. Australia for the purpose of rejuvenating the languishing cattle there. It was not until the early 1930's that systematic breeding of Z.'s began.

**Zebulun**, sixth son of Jacob and Leah (*Gen. xxx, 20*), and the reputed ancestor of the tribe of Israel bearing his name.

**Zechariah** (Hebr. *Zekarya* or *Zekaryahu*; the Lat. form *Zacharias* is derived from the Gk.), eleventh of the minor prophets; a contemporary of Haggai. He fl. about 520 B.C. Z. is mentioned in *Ezra* v.1. and vi.14, and *Neh. xii.16*. The book which bears his name is generally divided into two parts. The first part, consisting of chs. i.-xiii., is universally regarded as the original work of Z. The second part (chs. ix.-xiv.) called sometimes *Deutero Zechariah*, is placed by critics in Hellenistic times, while other scholars maintain that some pre-exilic material was used. Z. gives his message largely in the form of visions. His little summary of ethical duties (viii. 16-17), and his picture of the idyllic future Jerusalem (viii. 3-6) are worthy of the greatest prophets and poets.

**Zeebrugge**, seaport of W. Flanders prov., Belgium, 7 m. N. of Bruges, whose port it is. It has a fine breakwater, and a ship canal (7 m. long), connecting it with Bruges, which was opened in 1907.

During the First World War a Brit. naval raid was made on Z. on April 23, 1918. Its object was to block the submarine and destroyer exits (see also OSTEND). A party landed on Z. mole and destroyed its works, while a submarine loaded with explosives was run under the viaduct and exploded. Meanwhile the block ships were sunk and the survivors of their crews were rescued by the *Vindictive* and her consorts.

**Zeehan**, tn. of Tasmania, 90 m. E.N.E. of Hobart. It is the centre of a silver-mining dist. Pop. 3000.

**Zeeland**, Paul van (b. 1889), Belgian economist and politician, of the Belgian Catholic Party, b. at Soignes. He studied at the univs. of Louvain and Princeton, U.S.A. Since 1922 he has been a delegate at many international conferences on economic problems. He entered Parliament as a deputy for Brussels and was a minister without portfolio (1934-35). In March 1935 he became Prime Minister and minister of foreign affairs and foreign trade. In June 1936 he presided over the sixteenth session of the General Assembly of the League of Nations. After a personal campaign against him, he resigned in Oct. 1937. In Aug. 1949 he became minister of foreign affairs, retaining the position after the elections of June 1950. He has pub. books on economic problems, including *Regards sur l'Europe de 1932* (1933).

**Zeeland**, or **Zealand**, S.W. prov. of the Netherlands, has an area of 690 sq. m. Besides the mainland, five is. are included in the prov. The surface is very flat and much of it is below sea-level. The soil is fertile. Corn, butter, and cheese are

produced, and cattle roared. Chief tns. are Middleburg (cap.) and Flushing. Pop. 258,500.

**Zeeman Effect.** In 1896 the Dutch physicist and Nobel prize winner (1902) P. Zeeman (1865-1943) discovered that the lines of the spectra of atoms (*see* SPECTRUM) are changed when the atoms are situated in an intense magnetic field. In the simplest case each spectral line appears split into either two or three components, according as the observations are made on light emitted parallel to, or at right angles to the lines of the magnetic field; the light is also found to be polarised. The explanation of the effect given by Lorentz, although later shown to be over-simplified, was the first clear indication that the emission of light was to be attributed to electrons within the atom. The phenomenon provides a means of demonstrating that magnetic fields exist in the sun and stars, and allows these fields to be measured.

**Zeist**, or **Zeyst**, tn. in the prov. of Utrecht, Netherlands, with manufs. of porcelain-stoves, candles, soap, etc. Pop. 40,200.

**Zella-Mehlis**, tn. of Thuringia, Germany, 20 m. S. of Gotha. Pop. with Zella St. Blasir, 14,000.

**Zemstvo**, *see under* RUSSIA, *History*.

**Zemun**, *see* SEMLIN.

**Zenith**, point where a vertical line terminates in the celestial sphere, and thus the opposite of the nadir. It is therefore an important point of reference in astronomy; Z. distance being the angular distance of an object from the Z. and the complement of altitude. The Z. telescope, superseded by the transit instrument (*q.v.*), was invented for measuring the difference between the Z. distances of a pair of stars, culminating near the Z. at about the same time, one N., the other S. of the Z., from which latitude can be determined by Talcott's method. By Airy's reflex instrument, the star's image is viewed by reflection from a mercury surface.

**Zeno** (c. 340-265 B.C.), Gk. philosopher, founder of the Stoic philosophy, b. at Citium in Cyprus. He attached himself to the cynic Crates, but later studied under Stilpo of the Megarian school, and Diodorus Cronus and Philo of the same school. He then proceeded to the Academics, Xenocrates and Polemo, and opened a school for himself in the 'Painted Porch', Στάδ Ποικίλ. Hence his disciples were called Stoics (*q.v.*).

**Zeno** (426-491), Emperor of the E. 474-491, b. at Isauria. His reign was disturbed by revolts and foreign wars, and in 487 Z. persuaded Theodoric the Goth to invade Italy, in order to save himself and his cap.

**Zenobia**, **Septimia Augusta** (d. c. 271), Queen of Palmyra. After the death of her husband, Odenathus (A.D. 266), she became the regent for her sons. She tried to assert her authority over all Syria, Asia, and Egypt. She was defeated by Aurelian, taken prisoner on the capture of Palmyra, and carried to Rome.

**Zeolites**, family of minerals consisting

mainly of hydrous silicates of lime, soda, and alumina, which have resulted from the alteration of felspars and feldspatoids. Being chiefly secondary products, they occur in cavities and veins, and are common in amygdaloidal basalts, where they present a finely fibrous structure. Among the more common zeolites are analcite, natrolite, stilbite, prehnite, and laumontite. They have a specific gravity of about 2-3, and a hardness of from 3.5 to 5. Artificial minerals resembling Z. in composition are used in water-softening as, for example, in the *Permutit process*.

**Zephaniah**, ninth of the minor prophets, preached during the reign of Josiah (*Zeph.*, l. 1). The two chief features of his prophecy are his vivid portrayal of the Lord's Day as a day of disaster (1.14-18), and his doctrine that a righteous remnant will survive it (ii.3-7).

**Zephyrus** (*Ζεφύρος*), personification of the W. Wind, the son of Astræus and Eos. He was the father of the horses Xanthus and Balius by the harpy Podarge, and the husband of Chloris, by whom he begot Carpus.

**Zeppelin**, **Ferdinand**, Count von (1838-1917), Ger. inventor and designer, b. at Constance. He studied at the Polytechnik, Stuttgart, and at the Kriegsschule, Ludwigsburg, afterwards proceeding to Tübingen Univ. He took part in the Amer. Civil War, and also served in the Franco-Ger. War (1870), but from 1897 to 1900 was occupied in the construction of his first airship or dirigible balloon of rigid type, making his first ascent in 1900. In 1906 he flew 60 m. in 2 hours in an improved model. The development of airships in Germany for commercial and military purposes was due chiefly to Z., who gave his name to the rigid type. *See also under* AIRSHIP. *See E. Rosenkranz, Graf Zeppelin und sein Werk*, 1931.

**Zeppelins**, rigid airships invented by Count Zeppelin (*q.v.*). *See further under* AIRSHIP.

**Zeravshan**, or **Kara-Daria**, riv. of the Tajik and Uzbek S.S.Rs. It rises in the Z. Mts. and disappears in the wilderness near the Amu-Darya. Length 480 m.

**Zeran**, *see* CERAM.

**Zermatt**, vii., spa, and winter sports resort in Valais canton, Switzerland, at the head of the Visp Valley (5315 ft.), and at the foot of the Matterhorn, 22 m. by rail from Visp in the Rhône Valley. It is known for its invigorating climate and impressive scenery. Pop. 1100.

**Zero** (Arabic *ṣafra*, to be empty), term applied in mathematics to 0, or to quantity so small as to be negligible, and in physics to a point which serves as the base of measurements.

**Zetland**, *see* SHETLAND.

**Zeuglodon**, genus of extinct whales, found in the Eocene and Miocene strata of N. America, Europe, and Egypt. They were upwards of 50 ft. long, and the remains are the oldest known fossils of the order Cetacea.

**Zeugma** (Gk. ζεύγμα, a yoking), figure of speech in which a verb or adjective is used with two nouns, though strictly referring only to one.



**Zeus**, *see* JUPITER.

**Zeuxis** (fl. 425-400 B.C.), Gk. painter. *b.* at Heraclea. He belonged to the Ionic school of art and apparently drew his inspiration from Apollodorus. His reputed masterpiece was a picture of Helen which he painted for the city of Crotona.

**Zgorzelek**, *see* GÖRLITZ.

**Zhdanov, Andrei Alexandrovitch** (1896-1948). Russian politician. *b.* at Mariupol, son of a school inspector. In 1934 he became the secretary of the Leningrad Communist Party, his first key position, as Kirov's successor. He was also chairman of the Soviet commission for foreign affairs. He became a member of the Politburo, and was chosen by Stalin to expound the party policy at notably critical moments. His attitude on foreign and domestic matters was throughout uncompromising and ruthless. With the Ger. attack on Russia, he was charged with the defence of Leningrad, and carried out his duties with remarkable efficiency and energy. He became secretary of the Communist Party (1946). He was the leading spirit behind the formation of the Cominform in 1947. After his death the tn. of Mariupol (*q.v.*) was named after him.

**Zhitomir, or Jitomir**, tn. of the Ukrainian S.S.R., cap. of the Region of Z., on the R. Peretov, 80 m. S.W. of Kiev. It manufactures cloth, shoes, tobacco, and soap, and carries on trade in corn, hides, and timber. It was the scene of desperate fighting during the Second World War, and was severely damaged. *See further* under EASTERN FRONT or RUSSO-GERMAN CAMPAIGNS IN SECOND WORLD WAR. Pop. 95,100.

**Zhorokh**, *see* CHOROKH.

**Zhukov, Grigori Konstantinovich** (b. 1895). Russian soldier. In Feb. 1941 he became chief of staff of the Red Army. When Moscow was threatened by the Ger. advance, he was put in command of the outer defences of the cap. and the Gers. were hurled back. It was Z. who organised the defence of Stalingrad and Grozny. Subsequently he was transferred to the N. to effect the relief of Leningrad. Later, in the course of the Russian advance of 1944, Z. was sent to restore the Russian situation on the Ukrainian Front. He then led the central group of armies in the operations which resulted in the fall of Warsaw, the advance to the Oder, and the capture of Berlin. *See further* under EASTERN FRONT, or RUSSO-GERMAN CAMPAIGNS, IN SECOND WORLD WAR.

**Zielona Góra** *see* GRÜNBERG.

**Ziggurat**, *see* under UR.

**Zimbabwe**, site of some ruins in S. Rhodesia, S. Africa, 17 m. S.E. of Victoria, 120 m. E. of Sofala. They present the general appearance of a fortress. It is thought that they may have been erected by Arabs in search of gold in the area. Other archaeologists have suggested that the ruins are of Indian origin, and another school believes that they are a Bantu masterpiece, representative of the flowering of the Bantu culture in the Middle Ages. Carvings and vessels have been found there.

**Zimne**, *see* CHIENG-MAI.

**Zinc**, symbol Zn, atomic number 30, atomic weight 65.38, metallic element generally met with in combinations as the carbonate (calamine),  $ZnCO_3$ , and the sulphide (zinc blende),  $ZnS$ . It also occurs as silicate (hemimorphite),  $ZnSiO_3 \cdot 2H_2O$ , and as red Z. ore,  $ZnO$ . Silver, lead, and Z. are often found together in the same mineral vein, or in the same locality, notable instances being Broken Hill in New S. Wales, and Mt. Isa in Queensland, both rich Z. areas. Mexico is a large Z. producer: the U.S.A. produces 30 per cent of the world's Z. There are also large reserves of Z. in Canada and Russia, and deposits in Germany, France, Sweden, etc. The extraction of the metal from its ores is carried out in two stages, the oxide being first formed, and in the second stage this is reduced by carbon. Blende is the ore generally employed, and this is converted to oxide by roasting in air. The crude oxide is mixed with coal or coke and strongly heated by gas-fired furnaces, in clay retorts or muffles, and the Z. vapour condensed in an iron box



National Film Board, Canada

**ZINC MINING AT FLIN FLON, MANITOBA**  
Miners—steady the 'Stoper' gun in the mine which yields zinc, copper, gold, silver, cadmium and selenium.

(Silesian process). In the Belgian process the mixture is heated in a horizontal fire-clay tube connected by a conical clay tube to a sheet iron condenser. The crude Z. is melted in a reverberatory furnace and further purified by distillation. Process methods no longer employed are the Eng. method and the Carinthian method. In extraction older intermittent furnaces are being rapidly superseded by continuous vertical retort furnaces. Wet methods of extraction are by electrolytic

processes, and by electric reduction furnaces. The latter method is increasingly used in Sweden, the U.S.A., and the Soviet Union, where there are large reserves of hydro-electric power. Z. is a bluish-white brittle metal (sp. gr. 7, melting-point 430°, boiling-point 930°) which is malleable between 100° and 150° C. It is permanent in air at ordinary temp., and is used for galvanising iron for roofing purposes, etc. A number of alloys are formed by Z. with other metals, e.g. brass (copper and zinc), bronze (copper, tin, and zinc), etc. Z. burns in air, forming the oxide, ZnO (Z. white). The oxide is white at ordinary temp., but becomes yellow on heating. It is a basic oxide, and the salts of the metal can be prepared by its solution in acids. Z. sulphate (white vitriol) is obtained by solution of the metal or oxide in sulphuric acid, or is made on the large scale by roasting Z. blende in air. The sulphate crystallises from water, forming colourless rhombic prisms of the formula  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$  isomorphous with magnesium sulphate (Epsom salts). It has a metallic astringent taste, is poisonous, and is used as an emetic, in the dye industry as a mordant, and in the manuf. of varnishes. Z. chloride is formed by dissolving the metal or oxide in hydrochloric acid, and boiling the solution down until it solidifies on cooling. It is a white deliquescent substance, and made into a paste with Z. oxide rapidly sets to a hard mass. This mixture is used in dentistry as a filling. A solution of the chloride is used as a flux in soldering.

**Zinc, Extraction of,** see under METALLURGY.

**Zinc Sulphate,** see under ZINC.

**Zincography,** see PROCESS WORK.

**Zinder, or Sinder,** tn. of Niger Colony, in the Fr. Sudan, W. Africa, 356 m. from Timbuktu. There is trade in salt, spices, etc., and telegraphic communication with Kayes and Niamey. It is a walled city, and is a centre for trade across the Sahara to Tripoli. Pop. 6000.

**Zingiber,** see GINGER.

**Zink,** see CORNETT.

**Zinnia,** genus of garden-flowers of the family Compositae. *Z. elegans*, from which most of the varieties are derived, is an annual, and was introduced from Mexico in 1796.

**Zinoviev, Georgy** (1883-1936), Russian politician, b. at Elizabetgrad (now Kirovograd), his real name being Radomilsky Apfelbaum, another assumed name being Grigory Evseyevich. He had to leave Russia because of his revolutionary activities in 1908. He returned to Russia at the outbreak of the Revolution. In 1919 he became president of the Third International. In 1924, a letter purporting to come from Z., inciting rebellion, was pub. in the London Press, and possibly helped to defeat the Labour Gov. After the death of Lenin, Z. soon associated with Kamenev and with Trotsky against Stalin. He was expelled from the Communist Party. He was readmitted in 1929 but in 1935 was sentenced to 10 years' imprisonment for moral complicity in Kirov's

murder. In 1936 he was accused of and confessed to being involved in a plot aimed at Stalin's life, and was executed. Elizabetgrad, which had been renamed Zinoviesk in his honour, was later named Kirovograd. See also RUSSIA, History.

**Zinoviesk,** see KIROVOGRAD.

**Zion City,** see under DOWIE, JOHN ALEXANDER.

**Zionism, or Zionist Movement,** movement for the re-estab. of Jewish national life in Palestine (q.v.). It is the modern expression in organised form of the Jewish traditional love for Zion, and of the hope in the ultimate ingathering of Israel from the Diaspora. Various proposals for the resettlement of the Jews in their ancestral home were made from the end of the seventeenth century. Theodor Herzl (1860-1904), a Viennese journalist and playwright, pub. a pamphlet, *The Jewish State* (1896), in which he advocated the creation of an autonomous Jewish settlement as the solution of the Jewish question, and in 1897 convened a Congress in Basle to consider his project. This Congress, attended by over 200 delegates from all parts of the world, adopted as the programme of the movement: 'The aim of Zionism is to create for the Jewish people a Home in Palestine secured by public law.' The Congress founded a world-wide organisation, with headquarters in Vienna, consisting of federations with local societies. After the death of Herzl in 1904, the headquarters of the movement were transferred to Cologne, under the presidency of David Wolffsohn (1856-1914).

In 1908 the Zionist Organisation began practical work in Palestine by establishing an office in Jaffa and a Land Development Company, and engaged in urban and agricultural colonisation, as well as in educational activity. Progress was slow owing to limited resources. The organisation was maintained by means of the 'Shekel,' the ann. contribution which was paid by all members, and which entitled them to take part in the elections to the Zionist Congress. The Congress, the supreme organ of the movement, was held, after 1900, every two years. The Jewish National Fund was estab. in 1901 for the purchase of land in Palestine as the inalienable possession of the Jewish people. This Fund was raised entirely by voluntary contributions from Jews throughout the globe, and still exists. In 1911 the headquarters were moved to Berlin, where they remained until the First World War.

As a result of the efforts of two leaders in England, Dr. Chaim Weizmann (b. 1874) (q.v.) and Nahum Sokolow (1861-1936), the Brit. Gov., on Nov. 2, 1917, issued the Balfour Declaration (q.v.) in favour of a Jewish National Home in Palestine. From that time London became the headquarters. A few months later a Commission under Dr. Weizmann went to Palestine to act as intermediary between the Brit. military authorities and the Jewish pop. Its most notable achievement was the laying of the foundation-stones of the Heb. Univ. of Jerusalem. The Zionist leaders submitted their pro-

posals to the Peace Conference in 1919, and the Balfour Declaration was later embodied in the text of the Palestine Mandate, with which Britain was entrusted. Until 1929 the Zionist Organisation alone was the Jewish Agency for Palestine, but in that year the Agency was enlarged by the inclusion of non-Zionists. The prin. financial instrument of the Agency is the *Keren Hayesod* (Foundation Fund), which is raised by voluntary collections. After the estab. of the State of Israel the Zionist Organisation continued to devote itself to raising funds for the settlement there of Jewish immigrants. See N. Sokolow, *History of Zionism*, 1919; F. H. Kisch, *Palestine Diary*, 1938; A. Bein, *Theodor Herzl*, 1944; I. Cohen, *The Zionist Movement*, 1945; R. H. S. Crossman, *Palestine Mission*, 1947; and C. Weizmann, *Trial and Error*, 1949.

**Zips** (Hungarian, *Szepes*; Slovak, *Spíš*), dist. of Slovakia, Czechoslovakia, in the S.E. slopes of the High Tatra Mts., settled by Gers. in the thirteenth century. It is famous for its Ger.-style Gothic architecture, and especially for the massive ruins of Z. castle. The Ger.-speaking pop. (numbering some 170,000 in 1939) was deported after the Second World War.

**Zircon**, mineral composition silicate of zirconium,  $ZrSiO_4$ , found in Ceylon, the Urals, and Indo-China. It forms tetragonal crystals, colourless to yellow, also green and red (hardness 7.5, sp. gr. 4.7). The yellow Zs. of Ceylon are termed 'jargoons,' and the red-brown varieties are called 'hyacinths.' The latter are heat-treated and become greenish-blue gemstones. Z. has high colour dispersion and displays fire.

**Zirconium**, symbol Zr, atomic number 40, atomic weight 91.22, metallic element which occurs in nature as the silicate (zircon). It has been obtained in two forms, crystalline and amorphous, the former variety requiring a high temperature for its combustion, while the latter burns when gently heated in air. The metal is obtained by heating the fluoropotassium compound with aluminium or sodium. The metal melts at about 1700°C. It resembles silicon chemically. The normal salts are prepared from the feebly basic tetravalent hydroxide  $Zr(OH)_4$ .

**Ziska**, or **Zizka**, **Jan** or **Johann** (c. 1375-1421), Hussite leader, b. at Trocznow (Trocnow), Bohemia. He is said to have been a page in the retinue of Wenceslaus of Bohemia, and to have fought as a mercenary in the Eng., Imperial, and Polish armies. He became leader of the Hussite forces about 1490. He was a superb tactician, and his forceful personality held together many varying groups among the Hussites. He is a national Czech hero.

**Zita**, **Saint** (1218-1278). It. saint, b. at Monsagrati, near Lucca. From the age of twelve until her death she was a maid-servant to a Lucca family, being noted for her charity to the poor. She was canonised in 1690, and is venerated as the patron of domestic servants. Her festival is on April 27.

**Zither** (Ger. from Gk. *kithara*), stringed instrument of the dulcimer type, although etymologically connected with the cittern, which it does not resemble. It has many strings (twenty-seven to forty) stretched over a flat sound-box and is played with the tips of the finger, the bass strings alone being struck with a plectrum fixed to the thumb by a ring. The music played on it, mainly in the mt. regions of Austria and Bavaria, is mainly akin to types of folk-song and dance. It has a place in many small orchestras in cafés and inns in Germany and Austria, chiefly in the mt. dists.

**Zisudra**, or **Xisuthros**, Babylonian deity. He is the hero of a Babylonian poem (which survives only in fragments) on the Flood. The story is very similar to the Biblical version but the theological basis is different. After surviving the flood, Z., hitherto a mortal, is deified by the god Ea. See further under DELUGE.

**Zlatoust**, or **Slatoust**, tn. in the R.S.F.S.R. in the Chelyabinsk Region, 147 m. N.E. of Ufa, with iron foundries and machinery works. Precision instruments are made here. Z. has developed into a tn. since 1917. Pop. 99,000.

**Zodiac**, belt of the celestial sphere 16° wide, extending for 8° on each side of the ecliptic. Its antiquity is very great, and the region was noted by different peoples independently, a fact explained by its containing all the known planets as well as the sun and moon, and many stars grouped into constellations. It got its name 'zodiac' because many of these constellations were named after animals. The division into twelve signs, each extending over 30°, served to mark divisions of the year, each being marked by the entry of the sun, in his westward course, into a group of stars. The names have a seasonal significance intermingled with myth, and differ from the Chinese, Hindu, Chaldean, Egyptian, Gk., and Aztec. As the sun in spring crosses the equator, moving northwards, it travels through Aries, ♈; Taurus, ♉; and Gemini, ♊, respectively; at the summer solstice it is in Cancer, ♋, then commences its descent through Leo, ♌, and Virgo, ♍, these three marking the summer; Libra, ♎, Scorpio, ♏, Sagittarius, ♐, are then passed through in autumn; the first of these about Sept. 23; Capricorn, ♐, is occupied at the beginning of winter, Aquarius, ♒, and Pisces, ♓, Dec. 23, being traversed in the first part of the sun's ascent north of the equator. The 'ascending' signs are thus those of winter and spring, the 'descending' those of summer and autumn. The tropics of Cancer and Capricorn are circles of latitude on the earth's surface vertically under the sun at the spring and autumn solstices when it is in those signs. The signs do not now agree with the constellations bearing their names owing to precession (q.v.). Aries is in Pisces, and so on, the signs 'backing' into constellations to the W.

**Zodiacal Light**, faint haze of light extending from the sun along the ecliptic, visible just after sunset or before sunrise as

a cone extending above the sun's place into the sky. It is best seen in the evening about the vernal equinox, when the eastern portion of the ecliptic is most nearly perpendicular to the horizon; in the morning at the autumnal equinox, the western portion being then most so inclined. It is for these reasons best seen within the tropics, when it can be observed under favourable conditions right across the sky. Here the counter-glow or *Gegenscheln*, a bright patch of a few degrees in diameter, is seen exactly opposite the sun. The brightness of the Z. L. is sometimes quite conspicuous, though less so than the Milky Way. V. M. Sliper has found that the spectrum of the Z. L. is both reflected sunlight and also partly bright lines and bands, amongst which are the bright auroral lines in the yellow, due to tenuous gases. At the horizon it is 20° to 30° broad, and it extends to within about 10° of the zenith. It is most generally supposed to be due to sunlight reflected from clouds of meteoric bodies or very tenuous gaseous molecules extending in a flat disc round the sun to the plane of the solar equator, and beyond the earth's orbit. It has been photographed on various occasions and there is unmistakable evidence of fluctuations in extent and brightness in a period of only a few minutes. This suggests that the phenomenon may be partly due to electrified particles ejected by the sun, and there may be grounds for the theory that it is an extension of the corona.

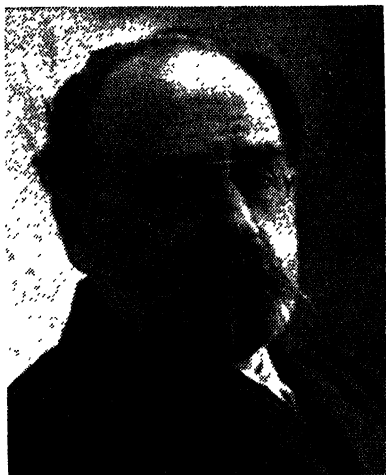
**Zoetrope**, see under CINEMATOGRAPH.

**Zoffany** (or **Zoffani**), **Johann** (1733-1810), Ger. artist, b. at Ratisbon. He studied in Rome, and settled in England (1758), and became an R.A. (1768). His works include portraits of Garrick and other famous contemporaries. He was particularly adept at conversation pieces.

**Zog**, see under ALBANIA.

**Zola, Émile Édouard Charles Antoine** (1810-1902), Fr. novelist and journalist, b. in Paris. His father, an engineer, was of mixed It. and Gk. descent. With the financial help of relatives, Z. was educated at Aix, the Lycée Saint Louis, Paris, and Marseilles Univ. One of his school friends was Cézanne (q.v.). Later, after living in poverty as a journalist he worked as a clerk in the publishing house of Haehetto; while there he made the acquaintance of Taine, Sainte-Beuve, and Michelet, and became a naturalised Frenchman. He also wrote literary and art criticisms for the *Événement*, as spokesman of the Impressionists, and in 1864 he published his charming if ineffective *Contes à Ninon* and, the next year, *Confession de Claude* which was reported to the public prosecutor as a dangerous book. He made his name with *Thérèse Raquin* (1867), a grim powerful story of remorse. Having thus discovered his real talent, he planned the *Rougon Macquart*, the story of a family during the decadence of the Second Empire, the twenty vols. appearing steadily over a period of a quarter of a century. He had the artist's imagination, a unique genius for description,

and the power of giving an impressive life to a crowd, a store, a market or a mine; these collective beings are often more living than the individual characters. In the novels of the Rougon-Macquart series, Z. proved himself, as an exponent of realism, the master of his age. *L'Assom-*



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#### ÉMILE ZOLA

*mon* (1879), in which he graphically describes the results of drink upon the fortunes of a working-class family, is an example of this type of Z.'s writing, by the brutality and coarseness of style and language. In many of Z.'s novels the sense of impending doom is all-pervasive; a notable example is *La Débâcle* (1892), a novel of the Franco-Prussian war. Some of his works, subordinate characterisation, and even the story, to the incultation of the Socialist philosophy, which was Z.'s personal solution to the material, and, to some degree, the spiritual problems of his age. His *Les Quatre Évangiles* (1899-1903), exemplify this aspect of his work. (*Justice*, the fourth book, was left unfinished.) Z. earned the gratitude of all opponents of anti-Semitism by his challenge to the Fr. Gov. to give Dreyfus (q.v.) a hearing. This appeared in *L'œuvre* in the form of the of the celebrated manifesto *J'accuse*. It resulted in Z. fleeing to England, but after Dreyfus's vindication he returned to France, a popular hero (1899). In 1908 his body was removed to the Pantheon. See lives and studies by G. de Maupassant, 1898; A. E. Vizetelly, 1904; M. Josephson, 1929; H. Barbusse, 1932; and J. Romains, 1935. See also J. Rewald, *Cézanne et Zola*, 1936, and L. M. Friedman, *Zola and the Dreyfus Case*, 1937.

**Zollverein**, literally, customs union

(Ger. *Zoll.*, customs; *Verein.*, union). The word is especially applied to the Prussian or Ger. customs union, founded through the efforts of the gov. of Prussia in 1834 from an amalgamation of smaller Zs., and resulting in national unity under Prussia.

**Zomba**, township and seat of gov. of the Nyasaland Protectorate, on the lower slopes of Z. Mt. at an altitude of 2900 ft., and 42 m. from Blantyre. With perennial streams running through it Z. is one of the most attractive centres in Brit. Africa. Government House is situated on the outskirts. Pop. 4400.

**Zone**, geometrically, the portion of the surface of a sphere intercepted between two parallel planes. The earth's climatic Zs. are determined by planes at the Arctic and Antarctic circles, and the tropics of Cancer and Capricorn. The resulting Zs. are known as the frigid, consisting of the polar caps; the torrid, between the tropics; the temperate, between the tropics and the torrid. They merely mark out the incidence of the sun's radiation, and are only useful as determining that factor, rather than as giving any clue to actual climate. Actual thermometric observations have led to the establishment of *thermal zones* between certain isotherms. The equatorial or tropical regions are marked by climate and vegetation arranged in *vertical zones* between different heights above sea-level. In astronomy, many star-catalogues of stellar positions are based on Zs.; thus Bessel's catalogue of 64,000 stars covers from dec.  $-15^{\circ}$  to  $+45^{\circ}$ , Argelander's, of 40,000, from  $-37^{\circ}$  to  $+80^{\circ}$ , Gould's of 73,160, from  $-23^{\circ}$  to  $-80^{\circ}$ ; and so on for many others. *The International Astrographic Catalogue*, the *Cape Photographic Durchmusterung* and Argelander's catalogue are arranged in Zs. of  $1^{\circ}$ .

**Zone Times**, see under TIME AND MEASUREMENT.

**Zoo-Geography**, see under GEOGRAPHICAL DISTRIBUTION.

**Zoological Gardens**, park in which wild animals are kept in captivity, for the purpose of zoological study and for public exhibition. Z. G. have existed at least since the fourth century B.C.: sev. Egyptian rulers kept their own Z. G. In England Henry I. estab. a menagerie at Woodstock. This was moved to the Tower of London about fifty years later, remaining there until 1831. The Zoological Society (*q.v.*) opened its Z. G. in Regent's Park in 1828. These Z. G. are now world-famous: they contain sev. hundreds of animals, reptiles, and birds of all kinds, and cover over 34 ac. In 1927 the London Zoological Society acquired 500 ac. at Whipsnade, which was opened as a 'Natural zoo' in 1931. There is a small zoo of the Whipsnade type at Chessington. Famous foreign Z. G. include the Jardin des Plantes, Paris, and the Berlin Z. G.

**Zoological Society**, in England, society for the promotion of the study of animal life (*q.v.*) founded in 1826. It received a royal charter in 1829. Its Zoological Gardens (the Zoo), comprising over 34

acs. in Regent's Park, London, were opened in 1828.

**Zoology**, branch of biology concerned with the study of animals and subdivided into many divisions, such as embryology (*q.v.*), histology (*q.v.*), anatomy (*q.v.*), and morphology (*q.v.*), which last deals with the form of the animal as a whole. The study of form is correlated with that of the functions of the parts, that is, with physiology (*q.v.*), a very extensive field intimately connected with bio-chemistry (*q.v.*), nutrition, metabolism (*q.v.*) locomotion, irritability, growth (*q.v.*), and reproduction. These studies, combined with those of geographical distribution (*q.v.*) and of ecology (*q.v.*), lead to an appreciation of the relation of the animal to its environment. In addition to distribution with regard to latitude and longitude, distribution above or below sea-level must be considered (see MARINE BIOLOGY and PLANKTON).

Comparison of animals of the same species shows that there is a variation which is probably due either to heredity (*q.v.*) or to the influence of environment. (See EUGENICS; EVOLUTION; LAMARCKISM; MENDEL, J. G.). Fossilised remains of animals show that evolutionary changes have occurred through long periods of time, and palaeontology yields some elucidation of problems arising in the study of recent species. (See FOSSILS; PALAEONTOLOGY.) Animals are classified in two main groups, the Vertebrates (*q.v.*) and the Invertebrates (*q.v.*). The Invertebrates are divided into numerous phyla, which are again subdivided; the Vertebrates constitute the bulk of the phylum Chordata. The chief phyla are: (1) Protozoa (*q.v.*, also PARASITOLOGY and TROPICAL MEDICINE), unicellular organisms (all other phyla are Metazoa, multicellular animals); (2) Porifera (Sponges, *q.v.*); (3) Coelenterata (including corals, jelly-fish, sea anemones, *q.v.*); (4) Platyhelminthes, the flat-worms (see CESTODA; TAPE-WORMS); (5) Nemathehelminthes, the threadworms (NEMATODES *q.v.*, also ANKYLOSTOMIASIS, BILHARZIASIS, FILARIASIS, and TROPICAL MEDICINE), hook-worms (Acanthocephala), and arrow-worms (Chetognatha). These are now usually divided into three separate phyla; (6) Trochhelminthes, including the rotifers; (7) Mollusca, now usually divided into Phoronida (see PHORONS), Polyzoa (*q.v.*), and Brachiopoda (*q.v.*); (8) Echinodermata (*q.v.*); (9) Annelida or Annulata (see EARTH-WORMS); (10) Arthropoda, including the classes Crustacea (*q.v.*), Onychophora (*q.v.*), Myriapoda (*q.v.*), Insects (see ENTOMOLOGY; INSECTS, INSECT BITES AND STINGS; LOCUST; MOSQUITOES; PARASITOLOGY; SANDFLY FEVER), and Arachnida, the spiders (*q.v.*); (11) Mollusca (see MOLLUSCS), including the snails, mussels, oyster, octopus; (12) Chordata, animals with a notochord that may persist throughout life or be replaced by a vertebral column. There are four sub-phyla, the Hemichordata, including Balanoglossus (*q.v.*), the Urochordata, the Cephalochordata (see AMPHIOXUS), and the Vertebrata or Craniata, including

the Cyclostomata, Pisces, Amphibia, Reptilia, Aves (see BIRD), and Mammalia (see MAMMALS). See also under separate headings. See *The Cambridge Natural History* (1895-1909); G. R. De Beer, *Vertebrate Zoology*, 1928; Sir A. E. Shipley and E. W. Macbride, *Zoology* (4th ed.), 1920; C. Singer, *A Short History of Biology*, 1931; Sir J. A. Thomson, *Biology for Everyman*, 1934; and *Outlines of Zoology* (9th ed.), 1944; L. A. Borradaile and F. A. Potts, *The Invertebrata* (2nd ed.), 1935; and A. J. Grove and G. E. Newell, *Animal Biology* (2nd ed.), 1944.

**Zor-kul**, see VICTORIA, LAKE.

**Zoroastrianism**, or **Mazdaism**, religion of the Persians, introduced by Zoroaster or Zarathushtra, who probably lived about 800 B.C. He was either a Mede or a Bactrian, and was evidently a man of extraordinary personality. He commenced teaching at the age of thirty, after many years spent in contemplation, and *d.* at the age of seventy-seven. The religion he founded was the national religion of the Persians from about 550 B.C. to the middle of the seventh century A.D. At this time Persia was invaded by the Mohammedans, and the faithful followers of Zoroaster fled to India, and are now represented by the Parsis (*q.v.*). In the anct. Gothic period *Z.* was a *monotheistic* religion based on a philosophy of *Dualism* of good and evil spirits. The supreme Lord of the whole Universe was called by Zoroaster *Ahuramazda*, and the two spirits—*spento-mainyush* (good) and *angro-mainyush* (evil)—were merely tools in the hands of the Highest to work out His grand plan of the universe. *Z.* was a practical, ethical doctrine inculcating active charity, kindness to animals, and moral conduct generally. The central feature of Zoroastrian ritual was fire worship, as with the Parsis, together with elaborate methods of preventing defilement. Each man, according to *Z.*, had a free will, conscience, and a soul, and a guardian spirit or prototype of himself who dwelt above, and was called a *fravashi*—being really his own character put into a spiritual body. Having the choice of good and evil, man naturally has to suffer the punishment of sin. Mazdaism, in spite of its later corruptions, has its higher side. Its aspirations for purity and a holy life, and its expressions of sorrow for evil, gave it a high place among the religions of the world. Its later corruptions and formalism could not endure against the fanaticism of Islam, and save for a few representatives in outlying parts of Persia and its modern adherents, the Parsis in India, it has died out. See M. N. Dhalla, *Zoroastrian Civilization*, 1922; J. H. Moulton, *Early Zoroastrianism*, 1927; A. V. W. Jackson, *Zoroastrian Studies*, 1928; J. D. C. Pavy, *Zoroastrian Doctrine of Future Life*, 1929; A. S. Wadia, *The Message of Zoroaster*, 1935.

**Zorrilla y Moral, José** (1817-93), Sp. poet and dramatist, *b.* at Valladolid. He studied for the law at Toledo and Madrid, but soon devoted himself to literature. Works include an elegy on the death of

Larra (1837); *Cantos del Trovador* (1841); *Granada*, an incomplete epic (1852); *El Zipatero y el Rey*, a comedy (1840); and *Legenda del Cid* (1882). His work falls into the Romantic school, being distinguished by its element of fantasy, and the wealth of feeling. See life by N. A. Corbiés, 1917-20.

**Zosimus, Saint** (fl. 417), pope and saint, of Gk. birth. He was pope from 417 to 418, and his pontificate was notable for the condemnation of Pelagianism.

**Zouaves**, body of infantry troops in the Fr. army, so called from the Kabyle (Algeria) tribe of Zwawa, from whom Gen. Clausel formed a regiment in 1831. These native troops were at first officered by Frenchmen, and a certain number of Frenchmen were included in the ranks, but this proved unsatisfactory, and the native element gradually died out. The *Z.* are among the most carefully-chosen troops in the Fr. army. The picturesque Moorish dress is still maintained. The *Z.* fought in N. Africa under Locleiro in the Second World War.

**Zsigmondy, Richard** (1865-1929), Austrian chemist, *b.* in Vienna. He held various lectureships and became prof. of colloid chemistry at Göttingen Univ. in 1907. *Z.* discovered methods for making colloid-chemical solutions, and constructed the first star dialyser. He was awarded the Nobel Prize for chemistry in 1925.

**Zuccaro, Federigo** (1542-1609), It. painter, *b.* at Sant' Angelo; brother and pupil of the artist Taddeo *Z.* A fine portrait of Queen Elizabeth is commonly ascribed to him. Sev. other pictures are in the National Gallery. His work follows in the tradition of Raphael and Corregio.

**Zug**: 1. Canton of Central Switzerland. It is the smallest of the cantons, having an area of 93 sq. m. *Z.* joined the Swiss Confederation in 1352. The S. and S.E. parts are mountainous, the highest peak being the Kaiserstock. The rest is in the basin of the Reuss, and possessing suitable grazing and pasture, produces butter, cheese, etc. Much fruit is also grown. Lake *Z.*, with an area of 21 sq. m., lies partly in *Z.* canton, and partly in Schwyz. Pop. 36,600. 2. *Tn.*, cap. of above, on Lake *Z.* There are manufs. of textiles and electrical equipment. There are fine examples of fifteenth-century and baroque architecture. Pop. 14,400.

**Zuider, or Zuyder, Zee**, formerly an arm of the N. Sea, penetrating into the N.W. Netherlands. It has now been largely reclaimed. Its area up to 1923 was 2027 sq. m. It then consisted of an oval inner part and a horn-shaped outer part, joined by a strait about 10 m. wide. A chain of islands—Texel, Vlieland, Terschelling, Ameland, and Schiermonnikoog—separated it from the N. Sea, are the remains of the original coastline. The *Z. Z.* was formed in the thirteenth century by the sea breaking through the sand dunes on the coast and flooding the lowlands between it and a small inland lake, with which the floods united. The *Z. Z.* always remained very shallow, the depth never exceeding 40 ft. and being only 3 ft. over

large areas. It contained sev. is. and received the R. Yssel. In 1918 a law was passed to provide for the reclamation of the Z. Z. to make a new prov., and work was begun in 1923. In 1950 crops were being grown on hundreds of acs. of reclaimed land. The largest sections completed were the Wieringermeer Polder (50,000 ac.) in 1930 and the Noordoostelijke Polder (120,000 ac.) in 1942. The Gers. inundated the 77 sq. m. of the Wieringermeer Polder 3 weeks before their final capitulation in 1945, but the area was drained again in the same year. Planning for other Polders in the S.E. and S.W. aggregating nearly 400,000 ac. was in progress in 1950 and the first dredging operation in the heart of the S. part of what was once the Z.Z. began in June. An area behind the barrages will be kept as a fresh water lake, the Yssel (or IJssel) Meer (300,000 ac.) See further under HOLLAND : NORTH EAST POLDER : LAND RECLAMATION.

**Zulia**, state of W. Venezuela, bordered on the W. by Colombia. It is well-watered, and has a tropical climate. Maracaibo is the cap. Cocoa, sugar, cotton, and coffee are grown, and there are rich timber reserves. Area 25,283 sq. m. Pop. 345,700.

**Zulla**, see ADULE.

**Zululand**, dist. of S. Africa, since Dec. 30, 1897, a prov., occupying the N.E.



South African Railway

#### ZULU

coastal region, of Natal. Area 10,425 sq. m. It includes Tongaland, and is bounded by Vryheid on the W., Swaziland and Mozambique on the N., Natal proper on the S., and the Indian Ocean on the

E. and E.S. The surface is mainly mountainous, but is much flatter in the N.E. It is watered by the Tugela, which for about 100 m. forms its southern boundary, the Blood R., a trib. of the Tugela, forming the western boundary, Umbalusi, Umvolosi, and Mkusi Rs. The Mkusi flows into the large shallow St. Lucia Lake, and finds its way to the sea at St. Lucia Bay with the Umvolosi R. There are large forests, and the land is very fertile, though in recent years signs of soil erosion and exhaustion have become increasingly apparent. Sugar is the most important product and is exported in quantity; tea, cereals, especially maize, fruits, and vegetables are grown, as well as beans, cotton, and coffee. Stock-raising is also carried on. Europeans own only about a quarter of Z.: most of it is crown land, held as native reserves. When Z. was annexed in 1897, with a promise of the preservation of its lands, a Lands Commission was instructed to provide liberally for natives in view of their requirements. In the result, about three-quarters of Z. was formed into reserves and placed under the Zululand Native Trust. The potential mineral wealth is very great : there are considerable gold deposits in the S., and coal, lead, copper, tin, and silver are also found. The climate is healthy except on the coast, where fever is prevalent. The rainfall averaging about 40 in. per year. Modern science, however, has eliminated the tsetse fly from Z. The flat, swampy coast-land is not navigable. The prin. tn. is Eshowe. Other townships include Umfolozi, centre of a sugar-cane dist., Matubatuba, from which there is rail connection with the Pongola riv. valley, through a sugar and cotton dist. Somkele; Candover; and Nongoma. A railway runs along the coast from Durban to Golei in the S.E. corner of the Transvaal, via the St. Lucia coalfield, W. of the St. Lucia Lake, otherwise there are no railways in Z. The main roads are good. There are increasing educational facilities, even in remote vills. The leading Christian denominations have churches in Z. Z. is governed by a provincial council and an administrator appointed by the governor-general. Pop. 360,000 (including 600,000 Europeans). See also under NATAL : SOUTH AFRICA : ZULUS.

**Zulus (Amazulus)**, S. African people belonging to the Bantu stock. Both physically and intellectually they are a fine race. They are advanced in domestic arts. When industrialised, they have proved skilful artisans. The reverential worship of the dead occupies a large place in the religion of the Z. There is an extensive folklore, and the unwritten code of laws is well observed. Gov. is by chiefs, through the heads of dists. The importance of the nation dates from the beginning of the nineteenth century, when it was organised and led through a series of victorious campaigns by the chief Chaka, who practically became master of S. Africa from Cape Colony to the Zambesi. He was murdered in 1828 and was succeeded by his brother, Dingaan, who

in 1838 brought about a war with the Boers, by whom he was defeated. The next rulers were Umhanda (*d.* 1873) and Cetywayo (*q.v.*), during whose reign war broke out with Great Britain. (See **ZULU WAR** (1879)). Zululand was annexed to Great Britain in 1887, and became part of Natal in 1897. See J. Y. Gibson, *The Story of the Zulus*, 1911; J. Stuart, *History of the Zulu Rebellion, 1913*; I. Evans, *Native Policy in Southern Africa*, 1935; Sir R. Coupland, *Zulu Battle Piece*, 1948.

**Zulu War** (1879), arose out of Zulu-Boer disputes over the possession lands on the Transvaal border. When the Transvaal was annexed, Cetywayo (*q.v.*) undoubtedly expected that the British would do justice to him as he conceived the case, on the subject of the land disputes which had been so bitter a source of contention between him and the Boers. But Shepstone (*q.v.*), Administrator of Transvaal, eventually decided that the Zulu claim was unfounded, and Sir Bartle Frere, the High Commissioner, was led to agree. He then sent an ultimatum to Cetywayo calling upon him to disband his army and justified this demand on the ground of the oppressive rule of the Zulus. Cetywayo refused and the war began. The Brit. crossed into Zululand in five columns, one of these was promptly cut up at Isandhlwana (*q.v.*). This defeat was followed by the great epic of Rorke's Drift (*q.v.*). The Zulus were finally crushed at Ulundi in 1879. Cetywayo fled, but was captured. See F. W. Chesson, *The War in Zululand: A Review of Bartle Frere's Policy*, 1879; H. Mason, *The Zulu War: Its Causes and its Lessons*, 1879; For Cetywayo's story of the Zulu nation and the war see *Macmillan's Magazine* for Feb. 1880.

**Zungaria**, see **DZUNGARIA**.

**Zurbaran, Francisco** (1598-1662), Sp. painter, b. at Fuente de Cantos of peasant extraction. He went to Seville and in 1625 he was engaged to paint an altarpiece for the cathedral there; while in 1650 he was appointed one of the painters to the king, Philip IV. Nearly all his works are marvels of technical accomplishment, but do not show the artist gifted with any great imaginative faculty.

**Zürich**: 1. Canton of N. Switzerland, bounded on the N. by the Rhine. Area 667 sq. m. Its N. part is open and undulating, while the central and S. portions are hilly with summits rising to 4000 ft. It forms part of the basin of the Rhine, and is also drained by the Töss, Glatt, Limmat, Thur, Sihl, and Reuss. The greater part of Lake Z. lies within the canton. Agriculture is carried on in the N., and the manufs. include textiles, machinery, and metal work. Pop. 741,000. It has been estimated that 44 per cent of the pop. of Z. are engaged in industry: the pop. is increasingly concentrated in the N. parts of the canton. The official language is Ger.; the spoken language is Z. dialect. The majority of the pop. is Protestant. 2. Cap. of the above canton, situated at the exit of the Limmat from Lake Z., 60 m. N.E. of Bern. The old

part of the tn. is very picturesque. Z. is the centre of Swiss commercial life. Manufs. include textiles, machinery, confectionery, chemicals, paper, printing, etc. Tourism is one of Z.'s biggest industries and there are sev. large hotels. Z. univ. founded in 1833, and there is a famous Institute of Technology. The cathedral, or *Grossmünster*, contains architecture dating from the eleventh to the eighteenth century. Zwingli (*q.v.*) was pastor here in the sixteenth century. The *Fraumünster* is a ninth-century foundation, and contains some fine thirteenth-



Swiss Federal Railways

THE GROSSMÜNSTER, ZÜRICH, WITH A STATUE OF HANS WALDEMANN BY HERMANN HALLER (1910)

century work with some magnificent modern frescoes by Paul Bodmer. The church of St. Peter is noted for its baroque; other buildings in the baroque style include the *Kathaus* (1694-98), and some fine private mansions.

There was a Rom. settlement on the site of Z. in the first century B.C. There was an Alemannic settlement at Z. in the fifth and sixth centuries, but it is not named as a tn. until the ninth century. In medieval times Z. was the most important of the Swiss tns. At the Reformation it embraced Zwinglianism. In the eighteenth century Z. was one of the centres of the Ger. literary revival. It then suffered a slight decline in importance, but this tendency was reversed towards the end of the nineteenth century, when Z. became a modern industrialised tn. Pop. (with suburbs) 400,000.

**Zutphen**, tn. in the prov. of Gelderland, Netherlands, at the confluence of the Yssel and the Berckel, 18 m. by rail N.E. of



Arnhem. The Groote Kerk (S. Walpurgis) is a twelfth-century foundation. Other interesting buildings are Wijn Huis Tower, and its pre-Reformation library. In the battle of Z., between the Eng. and the Spaniards, Sep. 22, 1586, Sir Philip Sidney (*q.v.*) was killed. Light industries include metalwork, silk manuf., and book-publishing. Pop. 22,000.

**Zuyder Zee**, see **ZUIDER ZEE**.

**Zweibrücken**, tn. of Bavaria, Germany, on R. Schwarzbach, 45 m. W. of Landau, formerly cap. of the anct. duchy of Z. Manufs. include machinery, textiles, shoes, etc. The famous printing-press dates back to the eighteenth century. The park is known for its 50,000 rose-plants. There is an eighteenth-century palace. Pop. 33,400.

**Zweig, Arnold** (b. 1887), Ger. novelist, b. in Glogau. He studied at Munich, Berlin, and Göttingen. Z. served in the Ger. Labour Corps during the First World War. Later he studied for the Bar and practised law, but subsequently devoted himself to writing novels and plays, including *Die Novellen um Claudia* (1912). In 1923 he settled in Berlin and became known as an enthusiastic Socialist and Zionist and achieved world-wide fame with his novel of the First World War, *The Case of Sergeant Grischka* (1928). In 1933 he was exiled from Germany and from 1934 resided in Palestine. Other pubs. include: *Young Women of 1914* 1931; *The Crowning of a King*, 1937; and *The Arc of Wandsbek* (trans.), 1947. Z. has also written short stories and essays on literature, politics, and Jewish problems.

**Zweig, Stefan** (1881-1942), Austrian-b. Brit. author, b. in Vienna, of Jewish parentage, and educated in Vienna. He acquired a great reputation as a writer of short stories and incisive studies of great personalities, not only in German-speaking countries, but achieved a wider public in Fr. and Eng. trans. He became well-known through his translations from the Fr. of Baudelaire, Verhaeren, and Verlaine, which were accompanied by critical essays. In 1920 he pub. *Three Masters*, essays on Balzac, Dostoevsky, and Dickens, psychological in treatment. His later volumes in this *genre* dwelt more on the pathological side of genius, as in his studies of Tolstoy, Nietzsche, Hölderlin, and Kleist. He wrote a number of short stories technically brilliant, but morbid in subject, dealing often with mental derangement and sexual abnormalities, the best, perhaps, being *Amok*, which appeared in 1923. He gave an unusual interpretation of Mary Stuart and Queen Elizabeth in his *The Queen of Scots* (1935), which might be described as romanticised biography. Forced out of Salzburg by the Nazis he settled in Britain, becoming a naturalised Brit. subject. His later published work included a novel, *Beware of Pity* (1939), a striking study of woman's psychology set in Imperial Austria, which ranks among Z.'s finest work. Z. took his own life in Petropolis, Brazil. See life by Frederike Zweig, 1948.

**Zwickau**, tn. of Saxony, Germany, on the R. Mulde, 60 m. S.W. of Dresden. Among its buildings are the Gothic Marienkirche, and the tn. hall (fifteenth to sixteenth centuries). During the Reformation Z. was a centre of the Anabaptist movement. It is near large coal-fields, and is an important industrial centre, with numerous manufs. Pop. 85,500.

**Zwingli, Huldreich**, or **Ulrich** (1484-1531), Swiss religious reformer, b. at Wildhaus, St. Gall, of peasant extraction. He studied at Bern, Vienna, and Basel. In 1506 he became par. priest at Glarus, and in 1512 and 1515 went on foreign service as chaplain to Swiss troops let out as mercenaries, for which he received a papal pension. In 1516 he became preacher to the Benedictine monastery at Einsiedeln, where he began to declaim against the pilgrimages to the shrine of the Blessed Virgin there. In 1519 he became preacher at the *Grossmünster*, Zürich. He now began to attack Catholic ceremony and doctrine: he declared the Scriptures the sole rule of faith, denying papal authority. Under his influence shrines were desecrated, sacred images destroyed, and all pictures removed from the churches. Z. won over Zürich tn. council in 1523, and in 1525, the Mass was finally abolished. Z. declared that the Eucharist was merely symbolic in significance, and on this point he quarrelled with Luther. Z. and Luther met at Marburg, only to part as bitter enemies. Z. took an active part in the war between Zürich and the Rom. Catholic Forest Cantons and was killed at Cappel, where his party met with a disastrous defeat. His break with the traditional beliefs and practices was much more extreme than that of Luther or the Eng. reformers. In many ways Z. anticipated Calvin, as in his views on predestination, and it seems probable that Calvin was greatly influenced by Z.'s teaching. The Church of England owes some aspects of its teaching to Z. The quarrel with Luther ensured that Z.'s ideas would never have much influence in Germany; the defeat at Cappel, and the later rise of Calvinism, limited their Swiss influence. See lives and studies by S. Simpson, 1902; and P. Burckhardt, 1918. See also A. Lang, *Zwingli and Calvin*, 1913, and W. Hadorn, *Die Reformation in der deutschen Schweiz*, 1928.

**Zwinglians**, name which was given to the disciples of the reformer Zwingli, and consequently to the Reformed Churches of German Switzerland in general. Owing to their controversy with the Lutherans concerning the real presence in the Eucharist, they were also called Sacramentarians. But the name which they themselves assumed was that of Evangelicals, which after a time displaced all others.

**Zwolle**, tn., cap. of prov. of Overijssel, Netherlands, on the Zwart Water, 53 m. N.E. of Amsterdam. The Gothic St. Michael's Church has a famous organ. The tn. is an important centre of transit trade, and has manufs. of iron, cotton,

etc., and shipyards. Near by is Agnetenberg Monastery, the home of Thomas à Kempis. Pop. 46,800.

**Zygote**, of fertilised egg, cell formed by the fusion of a male gamete (spermatozoon or male sexual cell) with a female gamete (ovum or female sexual cell).

**Zymotic**. Term used in medicine by certain authorities to designate the class of acute infectious illnesses. It was originally given a much wider application

because of the belief that the mode of action of the causative principle was analogous to, if not identical with, the process of fermentation. Its reference is now restricted to the chief acute infectious and contagious diseases, *e.g.*, typhoid, typhus, small-pox, diphtheria, cholera, scarlet fever, measles, whooping cough, erysipelas, etc. Because of the theory which it suggests, its use is now becoming increasingly rare.